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BIRD-BANDING

A JOURNAL OF ORNITHOLOGICAL INVESTIGATION

VOL. VIII OCTOBER, 1937 NO. 4

A FURTHER ANALYSIS OF SOME BANDING RECORDS OF THE EASTERN RED-WING[1]

BY FRED MALLERY PACKARD

THE SPRING MIGRATION

CERTAIN phases of the life-history of the Eastern Red-wing (*Agelaius p. phœniceus*) as disclosed by the banding records of the Austin Ornithological Research Station have been discussed in a previous paper[1]. Further study of those records has produced additional information about this race, some of which is summarized in this article. The material covers a period of six years, from June, 1930, to July, 1936. 1765 Red-wings were banded, with 266 returns.

Flocks may be studied as units in the field, all the birds watched, and general conclusions drawn about their movements. Broad observational accounts of the spring migration such as Allen presents[2] are hard to obtain from banding records alone. Such records present fragmentary histories of individuals captured at random from the flocks some time after they arrive. Some of their actions subsequent to arrival can be traced in those birds which repeat during the season. Thus certain facts that observation alone could not discover are disclosed by a study of banding histories.

In his discussion of the spring migration, Allen divides the arriving Red-wings into three groups: "vagrants," the irregular vanguard of the migration; "migrants," those birds which are passing through the area; and "residents," those which remain in the vicinity throughout the spring. By carefully watching the flocks as they flew over or into the Renwick marsh at Ithaca, he determined the status of each group.

Allen assumed that all the birds which followed a certain visible behavior in the swamp were migrants, and that all these moved on to other localities. The Austin records show unsuspected variation in the behavior of the migrating birds on Cape Cod. Some were apparently true migrants: they were caught but once, and did not repeat. Others lingered for a few days or even a month, repeating during that period, and then left: these also were migrants. A third group stayed in the vicinity from the time of their arrival through the nesting period, as true residents. A large fourth group was composed of individuals that were trapped once or twice on arrival,

[1]Contribution No. 29 of the Austin Ornithological Research Station.

and then disappeared, exactly like migrants; but these returned after an interval varying from two months to two weeks, some to nest nearby, others to disappear again.

The records of the banding at North Eastham show this fourth type of activity to be very common. Those records are too numerous to tabulate, but those of D. R. Griffin, operating a sub-station at Barnstable, thirty miles to the south, have been used to construct the accompanying graph.

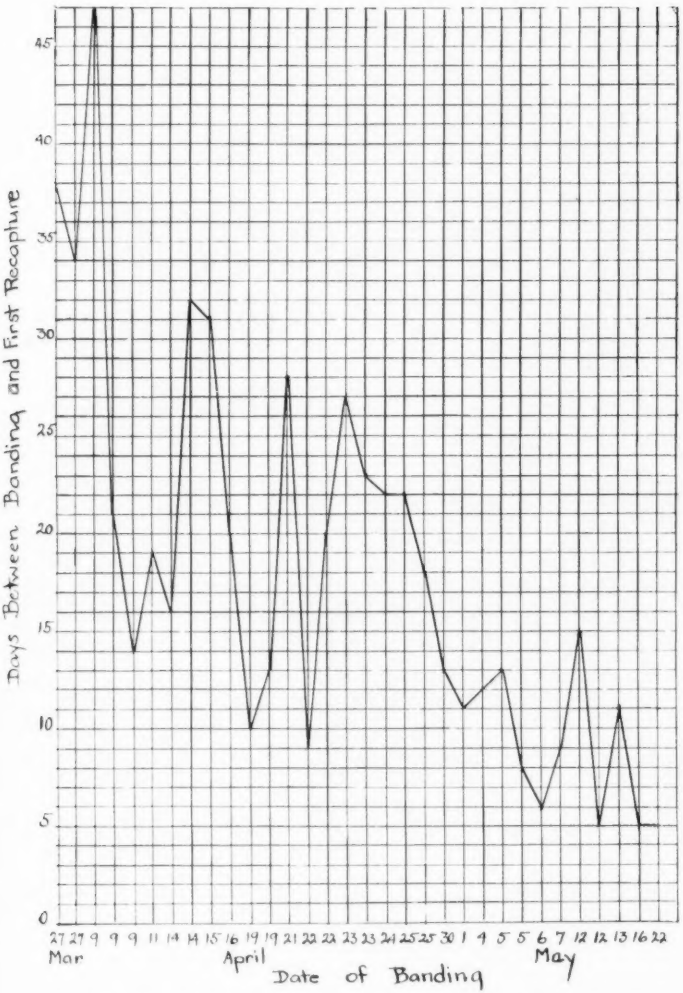
Griffin banded 142 Red-wings at Barnstable between March 27th and May 22d, 1934, during which time forty-three of the males repeated once or more often there. Thirty-two of these are featured in the graph, which shows the number of days intervening between the banding date and the first subsequent recapture of each bird.

The ordinate represents the date upon which the individual birds were banded. Varying numbers of birds were banded on different days, so the progression of the dates is irregular. Line A connects the dates of the first recapture of the individual birds; each abcissa, therefore, shows the number of days after banding during which there was no recapture of the bird which it represents. There were eleven males which repeated more or less regularly after banding, which are not shown. The graph suggests several things:

(1) That the status of the birds in the flocks is not as uniform as Allen and other observers have believed. The "vagrants" of March 27th both returned, probably to nest. A number of birds from the migrating flocks returned, others (99) moved on. (2) That there may be a period of wandering before the territory is established and nest-building begun. The gap between the coördinate and line A suggests this strongly. Probably this applies only to some of the birds, while others establish territories at once. (*Cf.* remarks on the Truro and Eastham colonies in the previous paper[1]. (3) That the period of wandering is longer among the earlier arrivals than among those reaching the area nearer the nesting season.

Cape Cod is a peninsula, and most of the Red-wings that pass through the station at North Eastham probably do not fly beyond Race Point at Provincetown. Instead, they turn back from that point, because of the cessation of the migratory impulse, or their refusal to cross the large body of water lying to the north. Between North Eastham and Race Point, at the tip of Cape Cod, are extensive marshes supporting large colonies of Red-wings.

The records, then, both at Barnstable and at North Eastham, have shown a peculiar but constant variation in the actions of some migrating Red-wings—namely, a period of absence after their arrival in the area where they are subsequently to nest. The conclusions drawn from this fact are, (1) that some arrivals stake their territories at once, but not near any convenient trap; (2) that some may wander in other areas before returning to nest; and (3) that



Graph Showing the Period of Absence from the Traps of male Red-wings at Barnstable, Massachusetts, after their first capture in the spring of 1934.

others may return after reaching Race Point through lack of inclination to go farther.

The dates for the spring migration are based entirely on the banding records, and the status given the individual birds depends on the number and arrangement of the repeats.

Vagrants do not occur every year, but when they do they precede the true migrants by a month. They may linger for several days, or even a month, but are gone by the time the regular migrants arrive. All the birds arriving in March and April that did not repeat at all have been considered migrants. If they repeated at more or less frequent intervals to the middle of May, or if they returned in middle or late May after an absence from the traps, they have been considered residents. The status of those arriving in later May, including a very large number of non-repeaters, cannot be determined; Allen's dates would indicate that they are all residents, which is unlikely. Known residents, as determined by the repeats, arrive with the migrants. Many of them show a fourteen-to-thirty-one-day gap between the first capture and the second.

Migration of Male Red-wings

Vagrants arrive irregularly, about the second week in March. (They are recorded for late February, but not banded.) The migrating flocks of adult males arrive between the fourth week of March and the end of May, concentrating the first week (mostly migrants) and the fourth week (more residents) of April. Fewer adult males are caught in May than in April, and no peaks are recorded then.

Except in a few cases migrant adult males cannot be distinguished from residents. There are many non-repeaters, but some of these may be guarding territories and are never recaptured. Others are migrants. Some, arriving as migrants, return to breed later in the season. Birds believed to be residents arrive as early as March 21st.

Migrant immature males arrive from the fourth week in March to the end of May. The migration is slow at first, but the tempo increases to the 9th of April, slackens a little, and culminates in a peak about April 20th, followed by a gradual decrease. In 1931 a second peak came on April 30th. In 1934 they arrived in a wave, April 1st to 3d, coming in numbers until the 19th, then decreasing. There are no recorded peaks in May.

Most of the April arrivals appear to migrate farther. Noble and Vogt have pointed out[3] that the unmated birds are more likely to leave the marsh during the nesting season than those breeding, and so should be expected at the traps then. The number of June captures is surprisingly low, but the truth of their conclusion is evinced by the fact that all the males caught in June are recorded as imma-

tures. Resident immature males arrived between April 4th and May 24th.

MIGRATION OF FEMALE RED-WINGS

Vagrants arrive irregularly, from March 1st to 29th. Migrants and residents arrive from mid-April to the end of May. They come slowly at first, increasing until a peak is reached in the third week of May, then decreasing. The period of absence following arrival is found to be as common amongst the females as amongst the males, and follows the same pattern.

It has not been proved that any of the adult females start south immediately after the first breeding. It is very possible, however, since there are several cases where females have been caught as repeats for several days between June 9th and 27th, and not during July. Also the reduction in the number of females of the ponds and marsh at the station after the first breeding is finished is very noticeable to the observer. It has been shown[1] that on Cape Cod the southward migration is earlier than on the mainland.

The dates of capture of females in July are between the 6th and the 25th, the peak being around the latter date. These are probably those birds which nested twice. There are no August records of adult females.

THE RETURN DATES

The fact that the first flocks of many species of birds "arrive" on or about the same date in the spring in successive years is well established. The correlated question whether the *individuals* of these species follow as rigid a schedule has been little considered.

One hundred sixty-three records of Red-wings returning in two consecutive springs are analyzed in the following table:

TABLE 1

Number of birds first trapped the same date as preceding year	4
" " " " " 1 to 7 days apart	39
" " " " " 8 to 15 " "	37
" " " " " 16 to 21 " "	27
" " " " " 22 to 28 " "	23
" " " " " 29 to 35 " "	15
" " " " " 36 to 37 " "	18
	163

The date of the "return" in banding does not necessarily indicate the date of arrival, which often precedes the day of capture. Nevertheless, the table shows that most of the birds do return about the same time in consecutive years, but that they probably do not follow as exact a schedule individually as they do as a species.

LONGEVITY

Averages compiled from the 266 returns show that 16 per cent of the total number of Red-wings banded survived one year, 7 per cent two years, 4 per cent three years, 2 per cent four years, and 0.3 per cent five years after banding. When graphed, these records yield a smooth curve, suggesting a steadily decreasing survival rate. However, it gives very little clue to the age they normally attain, for the age at banding varies. The oldest males in the records are two banded as adults in April, 1931, and taken yearly through 1936. As it requires at least two years to attain to adult plumage, these birds were hatched in 1929, or earlier, thus being at least seven years old. Several females lived five years after banding.

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SOME RETURNS OF BANDED BIRDS[1]

By MAY THACHER COOKE

THE present paper deals with a miscellaneous group of species, those for which a comparatively small number of returns have been received. This makes possible a careful study and getting the complete return data on any one bird. Included also are the returns of several supposedly sedentary species, which have yielded data of unusual interest. Among these are several cases in which the banded bird did not report at the traps for several years. This may have been accidental or may indicate some local migration.

The return files do not, of course, contain the record of individuals that are constant boarders at the traps. These are to be found in

[1] The word "return" in this paper is used in conformity with the system adopted by the United States Biological Survey in filing its banding records. This system manifestly is not based on the varied and important ornithological phenomena resulting from the recaptures of banded birds at the place of banding or elsewhere. Attention is called to this matter in order that foreign readers of *Bird-Banding* (and also not a few readers in the United States) may understand that the author is not attempting a complete analysis of the ornithological data presented.

It is suggested that those who are interested in banding terminology should read a paper written by Mabel Gillespie entitled "Suggestions for a Revised Bird-Banding Terminology," appearing in this Journal in 1930, Vol. I. pp. 14–19.—*The Editor.*

the station records, which must contain some interesting material. The repeating habits of some species probably account for the scarcity of return records, that is, the birds are never absent for three months.

Migration records are always interesting because of distance, direction, speed, or a combination of these. Longevity records, likewise, have special importance.

The Biological Survey would be glad to receive suggestions from the banding stations regarding particular groups or problems that they would like to have taken up in this series of papers. Such suggestions would be helpful in selecting the material for publication.

BELTED KINGFISHER. *Megaceryle alcyon*

210661, banded at McMillan, Mich., July 2, 1933, by Oscar M. Bryens, was caught in a trap at a fish hatchery at Stevens Point, Wis., September 4, 1933.

A415405, banded at Waukegan, Ill., June 8, 1930, by William I. Lyon, was killed at Libertyville, Ill., May 27, 1931.

A426430, banded at North Eastham, Cape Cod, Mass., April 13, 1931, by the Austin Ornithological Research Station, was retrapped at the same place October 13, 1932.

FLICKER. *Colaptes auratus*

10354, banded at Zehner, Sask., May 17, 1928, by J. A. Briggs, was recaptured May 28, 1930, in the same nest where it was banded.

399736, banded at Indian Head, Sask., July 13, 1926, by George Long, was caught at Illinois Bend, Tex., January 15, 1927.

623881, banded at Frankslake, Sask., June 25, 1929, by J. A. Briggs, was shot at Seagoville, Tex., February 23, 1931.

A345856, banded at Zion, Ill., June 13, 1930, by William H. Farrar, was shot 5 miles west of Hamilton, Ala., December 16, 1930.

A353177, banded at Detroit, Mich., July 15, 1931, by Henry E. Wagner, was found dead at Mobile, Ala., October 9, 1932.

A360227, banded at Fairdale, N. Dak., July 9, 1931, by Frank J. Vejtasa, was killed by a cat at Breslau, Tex., October 30, 1931.

A426251, banded at Zion, Ill., September 18, 1932, by Louise J. Miller, was killed by a small boy at Holly Ridge, La., in January, 1933.

A435724, banded at Sioux City, Iowa, September 7, 1931, by Mrs. Marie Dales, was killed at Dekalb, Tex., about June 27, 1932.

A443953, banded at Norristown, Pa., June 17, 1932, by R. J. Middleton, was caught at Johns, N. C., October 20, 1932.

B259302, banded at Rosyth, Alberta, June 27, 1933, by Harmon W. Burpee, was found dead at Ennis, Tex., about January 8, 1934.

B341346, banded at Northville, S. Dak., June 1, 1932, by J. F. Brenckle, was shot at Beaukiss, Tex., November 20, 1932.

B342707, banded at Fairmount, N. Dak., June 2, 1932, by G. C. Bierens, was shot 15 miles north of Liberty, Tex., January 1, 1934.

B379628, banded at Westfield, Wis., May 26, 1934, by Agnes E. Russell, was shot at Haynesville, La., November 17, 1935.

B390069, banded at Winnipeg, Manitoba, June 30, 1933, by J. P. Kennedy, was found dead at Wilburton, Okla., in November, 1934.

B394822, banded at Mesick, Mich., June 30, 1933, by Charles H. Bradshaw, was found dead at Tutwiler, Miss., October 25, 1934.

C304561, banded at Camden, N. J., June 17, 1933, by Walt Batezel, was killed at Mount Olive, N. C., December 29, 1934.

C304820, banded at East Westmoreland, N. H., June 13, 1934, by Lewis O. Shelley, was killed at Trenton, Fla., in November, 1934.

C332523, banded at Wilton, N. Dak., July 20, 1934, by Hannah R. Gray, was killed at Marietta, Okla., September 28, 1934.
C311727, banded at Bashaw, Alberta, June 16, 1934, by George L. Cook, was shot at Jasper, Tex., about January 20, 1935.
34-314413, banded at Aberdeen, S. Dak., July 2, 1934, by F. W. George, was caught at Fayetteville, Tex., October 28, 1934.

RED-SHAFTED FLICKER. *Colaptes cafer*

338981, banded at Claremont, Calif., May 23, 1925, by E. L. Sumner, Jr., was found dead at Ontario, Calif., August 20, 1927.
B342156, banded at Palo Alto, Calif., May 5, 1932, by Frank I. Fuller, was found dead at Atherton, Calif., July 12, 1932.

RED-BELLIED WOODPECKER. *Centurus carolinus*

215016, banded at Kansas, Ill., May 6, 1924, by W. B. Taber, Jr., was retrapped at the same place January 2, 1929.
242498, banded at Thomasville, Ga., March 30, 1924, by John B. May, was retrapped at the same place May 8, 1926, and March 11, 1927.
427557, banded at Leetonia, Ohio, May 20, 1926, by L. B. Strabala, was retrapped at the same place December 10, 1927, January 27, 1929, and March 20, 1932.
437201, banded at Fairhope, Ala., May 3, 1930, by Mrs. W. H. Edwards, was shot at Point Clear, Ala., January 7, 1931.

RED-HEADED WOODPECKER. *Melanerpes erythrocephalus*

216081, banded at Pewaukee, Wis., December 1, 1923, by Ethel M. Towne, was killed at Harviell, Mo., in August, 1927.
255115, banded at Crystal Bay, Minn., June 19, 1925, by Mr. and Mrs. F. W. Commons, was retrapped at the same place July 8, 1929.
343015, banded at Winterset, Iowa, July 17, 1925, by H. C. Waechter, was killed by a car 12 miles southeast of Des Moines, Iowa, June 29, 1927.
427625, banded at Sooth Haven, Mich., October 10, 1927, by Arthur Moore, was reported from Lillie, La., December 16, 1927.
462271, banded at West Lafayette, Ind., August 28, 1927, by L. A. Test, was retrapped at the same trap May 18, 1930.
A260926, banded at Clayton, Ill., July 21, 1931, by Russell S. Davis, was captured at Huntsville, Ill., May 17, 1933.
A270912, banded at Madison, Wis., on May 20, 1931, by Prof. George Wagner, was captured at Davenport, Iowa, when the bird alighted on frame of pen at a mink farm. When found it was in the grip of a mink, that was endeavoring to pull it through the wires. The bird died the next day of injuries, on June 20, 1931.

YELLOW-BELLIED SAPSUCKER. *Sphyrapicus varius*

34-316506, banded at Neebish, Mich., June 28, 1934, by A. D. Trempe, was killed near Rome, Ga., December 14, 1934.

HAIRY WOODPECKER. *Dryobates villosus*

110304, banded at Oliverea, N. Y., June 15, 1927, by Mrs. F. K. Daley, was retrapped at the same place January 27, 1928, May 20, 1929, and May 25, 1930.
219935, banded at Muscow, Sask., February 19, 1924, by R. H. Carter, Jr., was retrapped at the same place December 22, 1925, January 12, 1927, November 27, 1928, and February 20, 1929.
390463, banded at Tiffin, Ohio, November 30, 1925, by Eugene C. Stacy, was retrapped at the same place June 8, 1928, and was accidentally shot, with some sparrows at Tiffin, June 8, 1929.
393947, banded at Florence Lake, Big Creek, Calif., April 15, 1926, by Lila M. Lofberg, was retrapped at the same place, January 15, 1930.

70004, banded at Glenwood, Minn., January 5, 1927, by James V. Porter, was retrapped at the same place May 18, 1929, May 28, 1930, and May 15, 1932.
A200888, banded at Blaney, Mich., December 14, 1932, by K. Christofferson, was retrapped at the same place October 17, 1933, November 5, 1934, June 19, 1935 and April 13, 1936.

DOWNY WOODPECKER. *Dryobates pubescens*

83460, banded at Elkader, Iowa, February 2, 1925, by Kathleen M. Hempel, was found dead at Balsam Lake, Wis., October 25, 1925, a distance of more than 175 miles.
140206, banded at Manchester, N. H., January 28, 1927, by Eugene Goellner, was retrapped at the same place March 4, 1928 and March 27, 1931.
168987, banded at Petersfield, Manitoba, August 24, 1928, by A. Guilbert, was shot at Poplar Point, Manitoba, about June 1, 1929.
169355, banded at Crystal Bay, Minn., November 22, 1925, by Mr. and Mrs. F. W. Commons, was retrapped at the same place November 1, 1926, October 23, 1927, May 1, 1928, and April 28, 1929.
191572, banded at Gates Mills, Ohio, May 26, 1926, by S. P. Baldwin, was retrapped at the same place March 31, 1928 and May 12, 1929.
258132, banded at Windsor, Conn., November 21, 1924, by John G. Wolf, was found dead at Windsor, Conn., December 26, 1929.
424933, banded at Ottawa, Ont., August 8, 1926, by R. E. DeLury, was retrapped at the same place May 4, 1929, May 12, 1931, and May 3, 1932.
441773, banded at Canton, Mo., January 15, 1927, by Edgar L. Knight, was shot at Burlington, Iowa, July 5, 1927.
459144, banded at Oliverea, N. Y., April 20, 1928, by Mrs. F. K. Daley, was retrapped at the same place June 12, 1929, March 23, 1930, March 31, 1931, May 26, 1932, and February 14, 1933.
459195, banded at Muscow, Sask., March 6, 1927, by R. H. Carter, Jr., was retrapped at the same place November 27, 1931.
614189, banded at Clayton, Ill., December 7, 1929, by Russell S. Davis, was retrapped at the same place January 14, 1931.
A62715, banded at Rhinebeck, N. Y., February 12, 1927, by Maunsell S. Crosby, was retrapped at the same place January 26, 1930. The bird had not been taken between these dates.
A254409, banded at Dorlan, Chester Co., Pa., April 27, 1932, by H. A. W. Kates, was retrapped at the same place January 10, 1936.

EASTERN KINGBIRD. *Tyrannus tyrannus*

692527, banded at Jamestown, N. Dak., July 14, 1928, by Glenn L. Berner, was found with a broken wing and had to be killed at Harvey, N. Dak., June 26, 1930.

CRESTED FLYCATCHER. *Myiarchus crinitus*

B272230, banded at Lisle, Ill., May 30, 1934, by Dr. E. Jurica and V. Laketek, was retrapped at the same place June 13, 1936. This bird was bitten on the thigh by a garter snake at the time of banding two years before.

EASTERN PHŒBE. *Sayornis phœbe*

140984, banded at Harrison, Maine, August 2, 1924, by H. H. Cleaves, was killed in 1925 at Ellenton, S. C.
155135, banded at Rock, Mass., April 18, 1925, by A. W. Higgins, was retrapped at the same place July 17, 1926 and March 19, 1927.
174585, banded at Vienna, Va., July 4, 1926, by Carlo Zeimet, was caught in the snow at Spring Hope, N. C., March 4, 1927.
B74327, banded at Holderness, N. H., June 21, 1929, by Richard B. Harding, was reported from Headland, Ala., November 1, 1929.
C144541, banded at Westfield, Wis., June 4, 1935, by Agnes E. Russell, was reported from Hallettsville, Tex., about December 25, 1935.

H60619, banded at Guilford, Conn., July 9, 1933, by Harold L. Hutchins, was killed at Hobgood, N. C., December 24, 1933.

SAY'S PHŒBE. *Sayornis saya*

A188997, banded at Coachella, Calif., March 26, 1930, by Mr. and Mrs. Ben L. Clary, was retrapped at the same place March 12, 1931, and January 8, 1932. This bird is a year-round resident at Coachella and nests each year on a chimney beam. For two seasons her nestlings have been banded.

F25005, banded at Modesto, Calif., December 29, 1930, by C. H. Feltes, was accidentally shot when it flew into direct line as a boy was shooting pigeons 8 miles northeast of Modesto, December 1, 1933.

YELLOW-BELLIED FLYCATCHER. *Empidonax flaviventris*

C50944, banded at Summerland, B. C., June 23, 1931, by E. M. Tait, was shot at the place of banding June 30, 1932.

F38047, banded at Groton, Mass., May 29, 1931, by William P. Wharton, was caught by a cat near Groton, about May 18, 1934.

LEAST FLYCATCHER. *Empidonax minimus*

A2264, banded at Rock, Mass., July 3, 1924, by A. W. Higgins, was found dead at Lake Assawampsett, near Middleboro, Mass., June 4, 1927.

C62668, banded at Groton, Mass., June 5, 1930, by William P. Wharton, was retrapped at the same place May 13, 1934.

H93386, banded at East Westmoreland, N. H., May 31, 1933, by Lewis O. Shelley, was retrapped at the same place June 25, 1934.

HORNED LARK. *Otocoris alpestris*

B143978, banded at Rush, Colo., April 30, 1931, by Sam. J. Shellhorn, was retrapped at the same place August 30, 1932.

C51239, banded at McMillan, Mich., March 14, 1930, by Oscar M. Bryens was retrapped at the same place March 2, 1931.

BANK SWALLOW. *Riparia riparia*

H68930, banded at Ephraim, Wis., June 8, 1933, by Harold C. Wilson, was found dead at Manistique, Mich., June 30, 1934.

CLIFF SWALLOW. *Petrochelidon albifrons*

A19386, banded at Stanford University, Calif., May 3, 1926, by E. Myers, was retrapped at the same place April 20, 1928., and April 17, 1929.

F39897, banded at Jonesboro, Maine, June 12, 1931, by Arnold E. Davis, was retrapped at the same place July 9, 1933.

PURPLE MARTIN. *Progne subis*

A. B. B. A. 55422, banded at Melbourne, Fla., May 27, 1922, by W. I. Lyon, was found at Eau Gallie, Fla., February 27, 1928.

240552, banded at Winnipeg, Manitoba, July 31, 1924, by Andrew M. Davidson, was trapped in a martin-house and released unharmed at Fertile, Minn., June 27, 1930.

428492, banded at Vicksburg, Mich., June 27, 1926, by Frederick W. Rapp, was retaken at the same place May 24, 1932.

428534, banded at Vicksburg, Mich., June 27, 1926, by Frederick W. Rapp, was retaken at the same place May 29, 1931, and May 24, 1932.

A143038, banded at Ohio, Ill., July 12, 1925, by Esther L. Jackson, was caught at Sipe Springs, Tex., about November 23, 1929.

B163264, banded at McMillan, Mich., July 15, 1932, by Oscar M. Bryens, was retrapped at the same place April 30, 1934, June 14, 1935, and April 29, 1936.

B163265, banded at McMillan, Mich., July 15, 1932, by Oscar M. Bryens, was retrapped at the same place May 6, 1934, May 11, 1935, and April 15, 1936.

B221369, banded at McMillan, Mich., May 10, 1933, by Oscar M. Bryens, was killed at Clayton, Ala., April 16, 1936.

CANADA JAY. *Perisoreus canadensis*

436659, banded at Barkerville, B. C., September 23, 1927, by T. T. McCabe, was retrapped at the same place April 18, 1928, September 1, 1929, September 29, 1930, May 18, 1931, July 30, 1933, August 14, 1934, and August 10, 1936. On August 11, 1936, this bird was killed in a rat trap about half a mile from Barkerville.

436662, banded at Barkerville, B. C., September 25, 1927, by T. T. McCabe, was retrapped at the same place October 29, 1928, April 8, 1929, October 14, 1929, and October 6, 1931.

463986, banded at Barkerville, B. C., May 15, 1927, by Joseph Wendle, was retrapped at the same place November 3, 1929, and February 21, 1931.

STELLER'S JAY. *Cyanocitta stelleri*

267383, banded at Strawberry Flat, San Bernardino, Mts., Calif., August 29, 1927, by C. A. Barnes, was killed at Twin Peaks, Calif., May 11, 1929.

443254, banded at Calcite, Colo., October 23, 1926, by R. B. Jerrard, was retrapped at the same place February 15, 1929.

443279, banded at Calcite, Colo., November 13, 1926, by R. B. Jerrard, was killed at Steamboat Springs, Colo., October 7, 1930.

590910, banded at Cristola, Colo., August 20, 1927, by J. B. Rishel, was found at Green Mt. Falls, Colo., December 27, 1930.

652238, banded at Cristola, Colo., August 18, 1929, by J. B. Rishel, was found dead at the same place about April 15, 1933.

A403427, banded at Cristola, Colo., August 19, 1929, by J. B. Rishel, was caught in a trap at Green Mt. Falls, Colo., January 7, 1931.

CALIFORNIA JAY. *Aphelocoma californica*

240041, banded at Pasadena, Calif., October 9, 1924, by M. H. Finley, was retrapped at the same place May 8, 1928.

276002, banded at Berkeley, Calif., July 10, 1929, by E. D. Clabaugh, was shot at the same place February 28, 1932.

506878, banded at Berkeley, Calif., April 16, 1927, by Mary F. Hall, was retrapped at the same place January 28, 1931.

A411668, banded at Strawberry Canyon, near Berkeley, Calif., June 28, 1932, by E. L. Sumner, was retrapped at the same place May 11, 1934.

A377323, banded at Pasadena, Calif., June 6, 1931, by Harold Michener, was retrapped at the same place July 21, 1933. This bird comes to the lunch tables every day and eats out of hands.

B376336, banded at Berkeley, Calif., June 1, 1932, by Harriet W. Blake, was retrapped at the same place April 19, 1935.

AMERICAN MAGPIE. *Pica pica hudsonia*

A437719, banded at Horseshoe Lake, 8 miles west of Great Falls, Mont., May 22, 1932, was caught at Belt, Mont., April 10, 1933.

RAVEN. *Corvus corax*

560892, banded at Bowdoin Harbor, Labrador, July 18, 1928, by Donald MacMillan, was shot at Pinware River, Straits of Belle Isle, Labrador, about December 1, 1928.

WHITE-NECKED RAVEN. *Corvus cryptoleucus*

A622322, banded at Fort Bayard, N. Mex., April 10, 1931, by C. L. Snyder, was caught in a trap at La Feria, Tex., about February 9, 1935.

A648947, banded at Spur, Tex., November 7, 1931, by E. R. Kalmbach, was caught in a trap at Abilene, Tex., March 28, 1935.

B647376, banded at Fort Stockton, Tex., October 18, 1932, by Shaler E. Aldous, was killed at Caprock, N. Mex., July 10, 1934.

CROW. *Corvus brachyrhynchos*

208230, banded at Noblesville, Ind., May 11, 1928, by Malcolm F. Bundy, was killed at Atlanta, Ind., September 15, 1933.

223123, banded at Palmyra, N. J., May 13, 1928, by John T. Emlen, Jr., was found dead at Woodbury, N. J., November 28, 1932.

226175, banded at Muscow, Sask., June 29, 1924, by R. H. Carter, was shot at Fort Qu'Appelle, Sask., about August 10, 1931.

227831, banded at Muscow, Sask., July 20, 1924, by R. H. Carter, Jr., was found dead, probably killed by dogs, two miles east of Muscow, July 1, 1929.

227833, banded at Muscow, Sask., July 20, 1924, by R. H. Carter, Jr., was shot near Muscow, May 8, 1930.

228307, banded at Stillwater, Okla., January 2, 1923, by C. E. Sanborn, was found dead at Sioux City, Iowa, February 20, 1931.

450044, banded at Edmonton, Alberta, November 24, 1929, by William Rowan, was caught in a wolf trap at Shade Hill, S. Dak., December 17, 1929.

450319, banded at Edmonton, Alberta, November 9, 1929, by William Rowan, was shot at Oungre, Sask., December 24, 1929.

453101, banded at Portage la Prairie, Manitoba, October 10, 1935, by William Rowan, was shot at Minto, N. Dak. October 20, 1935.

453019, banded at Beaverhills Lake, Alberta, August 25, 1935, by William Rowan, was found dead at Celeste, Tex., March 22, 1934.

A519171, banded at North Eastham, Cape Cod, Mass., August 19, 1931, by the Austin Ornithological Research Station, was retrapped at the same place February 6, 1933, and March 30, 1934.

35-402818, banded at Chickasha, Okla., March 8, 1936, by Shaler E. Aldous, was shot near Manitou, Manitoba, May 23, 1936.

35-404174, banded at Norman, Okla., February 5, 1936, by Shaler E. Aldous, was caught in a trap at McAuley, Manitoba, May 5, 1936.

35-404208, banded at Norman, Okla., February 14, 1936, by Shaler E. Aldous, was shot at Wainwright, Alberta, April 27, 1936.

CLARK'S NUTCRACKER. *Nucifraga columbiana*

373893, banded at Big Creek, Calif., April 16, 1926, by Lila M. Lofberg, was retrapped at the same place, December 31, 1926, and July 18, 1930.

373897, banded at Big Creek, Calif., April 27, 1926, by Lila M. Lofberg, was retrapped at the same place April 16, 1927, and June 3, 1930.

CAROLINA CHICKADEE. *Penthestes carolinensis*

A46559, banded at Waynesville, N. C., August 24, 1927, by Marion A. Boggs, was retrapped at the same place December 19, 1929.

A62365, banded at Neotoma, Ohio, June 6, 1926, by Edward S. Thomas, was retrapped at the same place May 22, 1927, and April 1, 1928.

C98651, banded at Foster, Ohio, February 1, 1931, by Belden C. Saur, was retrapped at the same place January 15, 1932, July 18, 1932, and April 29, 1933.

MOUNTAIN CHICKADEE. *Penthestes gambeli*

74562, banded at Big Creek, Calif., February 2, 1928, by Lila M. Lofberg, was retrapped at the same place December 29, 1931.

HUDSONIAN CHICKADEE. *Penthestes hudsonicus*

A73365, banded at Barkerville, B. C., November 13, 1926, by T. T. McCabe, was retrapped at the same place October 14, 1927, November 22, 1928, and April 18, 1929.

CHESTNUT-BACKED CHICKADEE (*Penthestes rufescens*)

B34330, banded at Stanford University, Calif., April 24, 1929, by John B. Price, was trapped and released at the same place December 26, 1932.

TUFTED TITMOUSE. *Bæolophus bicolor*

168053, banded at Indianapolis, Ind., September 3, 1925, by Sue S. Sims, was retrapped at the same place, July 12, 1928.

638109, banded at Knoxville, Tenn., June 4, 1928, by W. M. Johnson, was retrapped at the same place February 21, 1929, December 27, 1929, and February 11, 1930.

A179660, banded at Fort Smith, Ark., May 25, 1931, by S. H. Weakley, was retrapped at the same place on May 2, 1932, November 8, 1932, and March 25, 1933.

PLAIN TITMOUSE. *Bæolophus inornatus*

A11869, banded at Altadena, Calif., on December 7, 1926, by J. Eugene Law, was retrapped at the same place April 28, 1929, August 11, 1929, and April 18, 1930.

A11871, banded at Altadena, Calif., December 7, 1926, by J. Eugene Law, was retrapped at the same place October 20, 1929, and May 7, 1930.

B25386, banded at Pasadena, Calif., July 4, 1928, by Harold Michener, was retrapped at the same place January 27, 1929 (had repeated to Sept. 14, 1928), and June 11, 1929.

B34326, banded at Stanford University, Calif., April 18, 1929, by John B. Price, was retrapped at the same place April 15, 1930, and April 23, 1931.

B44208, banded at Stanford University, Calif., April 28, 1928, by John B. Price, was retrapped at the same place April 25, 1929, and April 23, 1931.

BUSH-TIT. *Psaltriparus minimus*

B405, banded at Pasadena, Calif., July 27, 1927, by Harold Michener, was retrapped at the same place May 26, 1928; no repeats.

B406, banded at Pasadena, Calif., July 27, 1927, by Harold Michener, was retrapped at the same place May 24, 1929; no repeats.

WHITE-BREASTED NUTHATCH. *Sitta carolinensis*

51101, banded at Rhinebeck, N. Y., November 15, 1924, by Maunsell S. Crosby, was retrapped at the same place October 29, 1925, November 7, 1926, and November 25, 1927. This bird repeated 79 times in less than one and one-half months in 1924.

56503, banded at Antrim, N. H., May 14, 1923, by Mrs. Rachel E. Caughey, was retrapped at the same place June 11, 1924, March 5, 1925, May 5, 1928, October 2, 1928, May 23, 1929, December 2, 1929, September 11, 1930, and May 12, 1931.

74544, banded at Big Creek, Calif., April 19, 1927, by Lila M. Lofberg, was retrapped at the same place February 15, 1930.

142284, banded at Demarest, N. J., December 23, 1924, by B. S. Bowdish, was retrapped at the same place September 30, 1925, January 16, 1926, January 9, 1927, and August 23, 1927.

471561, banded at Branchport, N. Y., March 8, 1927, by Verdi Burtch, was retrapped at the same place September 9, 1931.

A51980, banded at Aurora, N. Y., February 1, 1927, by Miss I. L. Reveley, was retrapped at the same place October 17, 1928, May 22, 1929, and January 9, 1932.

A62716, banded at Rhinebeck, N. Y., February 12, 1927, by Maunsell S. Crosby, was retrapped at the same place January 31, 1930. This is the only retrap.

A63115, banded at Ottawa, Ontario, August 28, 1926, by R. E. DeLury, was retrapped at the same place February 27, 1927, November 27, 1927, July 15, 1928, and March 15, 1930.

A191442, banded at Kimmswick, Mo., February 18, 1931, by Dorothy A. Boyer, was killed at Festus, Mo., about January 20, 1934.

B53108, banded at Montclair, N. J., October 29, 1929, by Mrs. Charles S. Hegeman, was retrapped at the same place June 10, 1931, and May 16, 1932.

B111763, banded at Milton, Mass., November 30, 1930, by R. M. Hinchman, was retrapped at the same place November 1, 1931, and October 8, 1932.

C169528, banded at Katonah, N. Y., December 19, 1932, by Rudolph S. Fried, was retrapped at the same place October 5, 1933, July 22, 1934, and October 28, 1935.

H43951, banded at Stanford University, Calif., May 11, 1933, by John B. Price, was found dead at Campbell, Calif., about July 27, 1933.

PYGMY NUTHATCH. *Sitta pygmæa*

H01522, banded at South Rim, Grand Canyon, Ariz., October 23, 1932, by E. D. McKee, was retrapped at the same place February 22, 1936.

BROWN CREEPER. *Certhia familiaris*

A80474, banded at Waukegan, Ill., April 14, 1926, by William I. Lyon, was found injured at Ely, Minn., May 4, 1928. It died soon after.

B79745, banded at Concord, N. H., January 31, 1930, by F. B. White, was retrapped at the same place January 19, 1931.

F29822, banded at Amherst, Mass., February 19, 1932, by Mrs. F. M. Cutler, was retrapped at the same place, November 18, 1932.

WREN-TIT. *Chamæa fasciata*

52014, banded at Altadena, Calif., March 18, 1923, by J. E. Law, was retrapped at the same place October 16, 1923, and December 28, 1924. On April 13, 1926, it was killed in a mousetrap 125 yards from where it was banded.

A936, banded at Berkeley, Calif., August 2, 1925, by E. D. Clabaugh, was retrapped at the same place March 12, 1931 (repeated to March 29, 1931), and February 29, 1932.

A90724, banded at Berkeley, Calif., December 8, 1927, by Mary F. Hall, was killed in a mouse-trap at Berkeley, Calif., March 5, 1932.

F17784, banded at Berkeley, Calif., July 6, 1931, by E. L. Sumner, was retrapped at the same place February 25, 1932, and November 23, 1932. No repeats.

WINTER WREN. *Nannus hiemalis*

A163405, banded at Kokomo, Ind., January 22, 1931, by S. L. Wilson, was caught in a steel trap at Cutler, Ind., about December 2, 1931.

F53006, banded at Church Creek, Md., March 13, 1932, by Frank R. Smith, was retrapped at the same place November 1, 1932.

CAROLINA WREN. *Thryothorus ludovicianus*

A99374, banded at Waynesville, N. C., November 5, 1928, by Marion A. Boggs, was retrapped at the same place July 20, 1929, April 9, 1930, and April 30, 1931.

C167737, banded at Winter Park, Fla., January 10, 1933, by Edward M. Davis, was retrapped at the same place, May 8, 1935.

C53020, banded at Fairhope, Ala., May 18, 1930, by Mrs. W. H. Edwards, was retrapped at the same place, June 2, 1932.

CURVE-BILLED THRASHER. *Toxostoma curvirostre*

579077, banded at Oracle, Ariz., July 5, 1928, by Mrs. J. W. Lawson, was retrapped at the same place, April 9, 1930.

CALIFORNIA THRASHER. *Toxostoma redivivum*

520038, banded at South Pasadena, Calif., October 2, 1929, by Mrs. Alice C. Ward, was found dead at the same place May 30, 1933.

A267984, banded at Smythe Canyon, near Berkeley, Calif., February 5, 1931, by Mary M. Erickson, was found dead at Strawberry Canyon, near Berkeley, Calif., December 3, 1934. The last time it was trapped was March 7, 1932.

WOOD THRUSH. *Hylocichla mustelina*

426119, banded at Melrose Park, Philadelphia, Pa., August 28, 1926, by Dr. William Pepper, was retrapped at the same place July 21, 1930.

629386, banded at Wyncote, Pa., May 6, 1930, by William Pepper, Jr., was retrapped at the same place May 11, 1929, August 1, 1929, May 18, 1930, May 15, 1931, and May 15, 1933.

A202094, banded at Demarest, N. J., July 1, 1929, by B. S. Bowdish, was retrapped at the same place May 16, 1930, and May 18, 1932.

A219986, banded at Melrose Park, Philadelphia, Pa., August 22, 1930, by William Pepper, Jr., was retrapped at the same place May 13, 1931, May 18, 1932, had repeated twice, September 10, 1932, September 22, 1932, and May 1, 1933.

B131979, banded at Northville, S. Dak., May 26, 1931, by J. F. Brenckle, was found dead at Brunswick, Nebr., May 29, 1932.

HERMIT THRUSH. *Hylocichla guttata*

178859, banded at Altadena, Calif., May 13, 1928, by Walter I. Allen, was retrapped at the same place December 23, 1928, October 31, 1929, and December 21, 1930.

A120313, banded at Summerville, S. C., February 1, 1929, by William P. Wharton, was retrapped at the same place January 24, 1931, and February 4, 1933.

A3281, banded at Berkeley, Calif., November 26, 1925, by Ernest D. Clabaugh, was found dead at Berkeley, Calif., March 30, 1931.

A100028, banded at Milwaukee, Wis., October 3, 1928, by Paul W. Hoffmann, was found dead at Forest City, Ark., about October 30, 1929.

A170417, banded at Milwaukee, Wis., October 3, 1929, by Paul W. Hoffmann, was trapped at Madison, Wis., May 28, 1933.

B116085, banded at Elmhurst, Long Island, N. Y., October 31, 1930, by Marie V. Beals, was found exhausted at Brunswick, Ga., February 13, 1933.

C108093, banded at Zion, Ill., September 21, 1932, by Louise J. Miller, was caught at Boerne, Tex., about March 15, 1936.

H51760, banded at Zion, Ill., October 4, 1932, by Louise J. Miller, was found dead at Turkey, N. C., about March 10, 1934.

RUSSET-BACKED THRUSH. *Hylocichla ustulata*

A172556, banded at Beaver, Ore., July 16, 1930, by Reed Ferris, was retrapped at the same place May 22, 1931, and May 21, 1932.

C114043, banded at Northville, S. Dak., May 30, 1932, by J. F. Brenckle, was retrapped at Wilton, N. Dak., May 12, 1934.

VEERY. *Hylocichla fuscescens*

690306, banded at Clayton, Mo., May 5, 1929, by C. W. Allison, was found dead at St. Louis, Mo., July 30, 1931.

A228960, banded at Mohonk Lake, N. Y., August 21, 1929, by A. K. Smiley, Jr., was retrapped at the same place August 16, 1930, and August 2, 1931.

MOUNTAIN BLUEBIRD. *Sialia currucoides*

49915, banded at Denver, Colo., May 21, 1928, by J. B. and C. B. Rishel, was retrapped at the same place March 11, 1929 and March 6, 1931.

CEDAR WAXWING. *Bombycilla cedrorum*

C177657, banded at Shirley, Mass., July 11, 1933, by Edward M. and W. M. Davis, was found dead at Houma, La., February 25, 1934.

C190051, banded at Groton, Mass., August 31, 1933, by William P. Wharton, was captured at Watson, La., February 16, 1934.

NORTHERN SHRIKE. *Lanius borealis*

B271756, banded at Harwich, Mass., November 8, 1934, by O. L. Austin, was found dead at Clarenceville, Quebec, about April 1, 1936.

SHRIKE. *Lanius ludovicianus*

B166224, banded at Carmangay, Alta., June 25, 1933, by Dr. and Mrs. J. E. Horning, was killed at The Grove, Tex., December 22, 1933.

B252535, banded at Carmangay, Alta., July 16, 1933, by Dr. and Mrs. J. E. Horning, was killed at Granger, Tex., October 6, 1934.

WESTERN TANAGER. *Piranga ludoviciana*

179997, banded at Big Creek, Calif., July 6, 1926, by Lila M. Lofberg, was retrapped at the same place June 16, 1927, and May 22, 1928.

582225, banded at Big Bear Lake, Calif., August 9, 1929, by Wright M. Pierce, was retrapped at the same place August 2, 1932.

H43935, banded at Camp 19, Yosemite Valley, Calif., May 6, 1933, by Mr. and Mrs. A. E. Borell, was retrapped at the same place July 11, 1934, and June 20, 1935.

L34305, banded at Camp 19, Yosemite Valley, Calif., July 10, 1933, by A. E. Borell, was retrapped at the same place June 22, 1935.

SCARLET TANAGER. *Piranga erythromelas*

A286073, banded at Montvale, N. J., July 2, 1931, by Carl A. A. Pedersen, was retrapped at the same place May 18, 1932, and May 19, 1933.

ROSE-BREASTED GROSBEAK. *Hedymeles ludovicianus*

117449, banded at Peterboro, N. H., June 13, 1924, by Mrs. C. L. Whittle, was retrapped at the same place May 24, 1925, June 17, 1926, and May 15, 1927.

425324, banded at Wellesley, Mass., July 5, 1926, by Mrs. E. M. Dunham, was retrapped at the same place May 27, 1927, June 30, 1928, May 26, 1929, and June 12, 1930.

425326, banded at Wellesley, Mass., July 19, 1926, by Mrs. E. M. Dunham, was retrapped at the same place May 20, 1927, May 13, 1928, May 7, 1929, and May 10, 1930.

A152101, banded at Sioux Falls, S. Dak., June 1, 1929, by Mrs. Blanche M. Getty, was retrapped at the same place May 22, 1930 and May 19, 1931.

A222623, banded at Milford, N. H., June 7, 1930, by James P. Melzer, was retrapped at the same place May 21, 1931, and June 19, 1932.

BLACK-HEADED GROSBEAK. *Hedymeles melanocephalus*

68807, banded at Altadena, Calif., June 11, 1925, by J. Eugene Law, was retrapped at the same place April 21, 1930.

156120, banded at Pasadena, Calif., May 22, 1925, by Harold Michener, was retrapped at the same place May 14, 1926, and May 24, 1929. This is the first return since May 14, 1926.

156131, banded at Pasadena, Calif., July 20, 1925, by Harold Michener, was retrapped at the same place April 28, 1926, and May 26, 1928. Last previous repeat was May 2, 1926.

246471, banded at Altadena, Calif., May 2, 1927, by Laura B. Law, was retrapped at the same place July 2, 1929, and April 18, 1930.

PINE SISKIN. *Spinus pinus*

427151, banded at Barkerville, B. C., June 20, 1926, by T. T. McCabe, was retrapped at the same place June 24, 1927, May 31, 1928, and June 27, 1931.

B27790, banded at Barkerville, B. C., June 21, 1928, by T. T. and E. B. McCabe, was retrapped at the same place July 22, 1929, and June 20, 1930.

CROSSBILL. *Loxia curvirostra*

576253, banded at Barkerville, B. C., May 15, 1928, by T. T. McCabe, was killed by a cat at Hansard, B. C., August 11, 1931.

B168051, banded at Milton, Mass., May 12, 1932, by W. Rodman Peabody, was found dead at Bemidji, Minn., April 9, 1934.

FOX SPARROW. *Passerella iliaca*

121505, banded at Berkeley, Calif., January 14, 1924, by E. D. Clabaugh, was killed in a trap at the same place February 16, 1929.

132677, banded at Newton Centre, Mass., March 15, 1930, by Frederic H. Kennard, was caught at Little St. Lawrence, Newfoundland, April 20, 1930.

139440, banded at Strawberry Canyon, Berkeley, Calif., February 22, 1925, by E. D. Clabaugh, was retrapped at the same place November 20, 1930.

426634, banded at Paoli, Pa., November 21, 1928, by Horace D. McCann, was found at Deer Lake, Newfoundland, about May 30, 1930.

470117, banded at Berkeley, Calif., November 5, 1930, by E. L. Sumner, was retrapped at the same place October 7, 1931 (last repeat November 24, 1930), and March 27, 1932 (last repeat December 6, 1931).

470124, banded at Strawberry Canon, Berkeley, Calif., November 14, 1930, by E. L. Sumner, was retrapped at the same place October 12, 1931 (last repeat January 13, 1931), and March 10, 1932 (last repeat October 12, 1931).

A110379, banded at Woodacre, Calif., October 19, 1928, by J. Mailliard, was retrapped at the same place February 23, 1929, February 11, 1930, November 2, 1930, and March 20, 1931.

A171006, banded at Fargo, N. Dak., October 2, 1929, by O. A. Stevens, was killed at Ethelbert, Manitoba, April 11, 1930.

A218349, banded at Germantown, Pa., March 3, 1930, by John T. Emlen, Jr., was shot at Coinjock, N. C., December 1, 1930.

B128889, banded at Worcester, Mass., November 17, 1930, by Mrs. Kenneth B. Wetherbee, was killed at Fair Bluff, N. C., January 21, 1933.

B135664, banded at Strawberry Canon, Berkeley, Calif., March 17, 1931, by E. L. Sumner, was retrapped at the same place October 3, 1931 (last repeat March 31, 1931), and March 31, 1932 (last repeat October 28, 1931).

C44476, banded at Quincy, Mass., December 8, 1929, by Seth H. Low, was retrapped at Elmhurst, L. I., N. Y., December 27, 1930.

LINCOLN'S SPARROW. *Melospiza lincolni*

A93346, banded at Barkerville, B. C., June 5, 1927, by T. T. McCabe, was retrapped at the same place August 3, 1928, and May 15, 1929.

B13528, banded at Berkeley, Calif., April 16, 1929, by Ernest D. Clabaugh, was retrapped at the same place December 17, 1931.

B2547, banded at Altadena, Calif., April 10, 1930, by W. I. Allen, was retrapped at the same place November 19, 1930.

B27515, banded at Barkerville, B. C., May 25, 1928, by T. T. and E. B. McCabe, was shot for scientific purposes one mile from Barkerville, June 2, 1930.

B95144, banded at Jamestown, N. Dak., May 12, 1929, by Mrs. M. L. Guest, was found dead at Mildmay Park, Sask., May 24, 1929.

SWAMP SPARROW. *Melospiza georgiana*

98569, banded at Crystal Bay, Minn., May 9, 1924, by Frank W. Commons, was retrapped at the same place May 5, 1925, and April 23, 1927.

154388, banded at Crystal Bay, Minn., July 31, 1925, by Frank W. Commons, was retrapped at the same place April 23, 1930.

A29477, banded at Branchport, N. Y., July 15, 1925, by Verdi Burtch, was retrapped at the same place July 5, 1926, and May 4, 1927.

A54831, banded at Branchport, N. Y., October 7, 1926, by Verdi Burtch, was found dead at Renfrew, Ontario, May 2, 1928.

F31918, banded at Lisle, Ill., May 1, 1931, by Dr. Edmund Jurica, was found dead at Clarion, Mich., on May 2, 1932.

Biological Survey, Washington, D. C.

METHODS OF TAKING BIRDS OF PREY FOR BANDING

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DURING the winters of 1935–36 and 1936–37, 108 adult birds of prey of 13 species[1] were trapped, weighed, and banded near Stockton, Kansas, where the writer was employed as a science instructor in the high school. This work was made possible through the interest and coöperation of the high-school boys who looked after many of the sets.

Several types of traps were used, but the No. 1 double-jawed jump trap was found most effective. The jaws were first covered with friction tape, then wrapped with several layers of heavy Canton flannel or similar thick cloth, until the padding was about one-fourth inch thick, then this was covered with a double layer of tape. The cloth was cut in strips one inch wide before wrapping. The inner tape prevented the cloth from slipping on the jaws of the trap, and the outer layer held the cloth in place and helped to hold the bird. If the thickness of the wrapping is uniform, the end of the jaws will catch most of the impact and the jaws will stand apart slightly in the center when sprung, thus relieving the pressure on the bird's leg. The jump trap spring can be weakened by placing a block between the spring and the bottom of the trap and then forcing the free end of the spring downward by use of a vice or large pliers.

A full-grown hen was placed on the ground in a wire cage 14 by 16 inches, and four traps were set around the cage. Two traps were placed on posts close by. This method was used for one week each in two separate locations, and no catches were made with it. Sets in these same areas baited with dead rabbits were catching from one to three hawks a week and an occasional Great Horned Owl. One American Rough-legged Hawk was caught with a calf's head as bait. In the winter of 1936–37, while rabbit-baited sets were successful, trapping was carried on for two weeks around two dead sheep, but no hawks were caught, although several Magpies were taken at this set.

Although no catches were made at three winter sets baited with dead white-footed mice, I am certain that mice are an important food item of the hawks here, because when the weather turned warm in February, 1936, we were immediately unable to catch any more hawks at the sets baited with rabbits. This was attributed to the abundance of white-footed and harvest mice, which was evidenced

[1] American Rough-legged Hawk, 31; Marsh Hawk, 24; Great Horned Owl, 17; Swainson's Hawk, 9; Ferruginous Rough-leg, 7; Red-tailed Hawk, 6; Sparrow Hawk, 4; Burrowing Owl, 4; Turkey Vulture, 2; Harlan's Hawk, 1; Prairie Falcon, 1; Barn Owl, 1; and Screech Owl, 1.

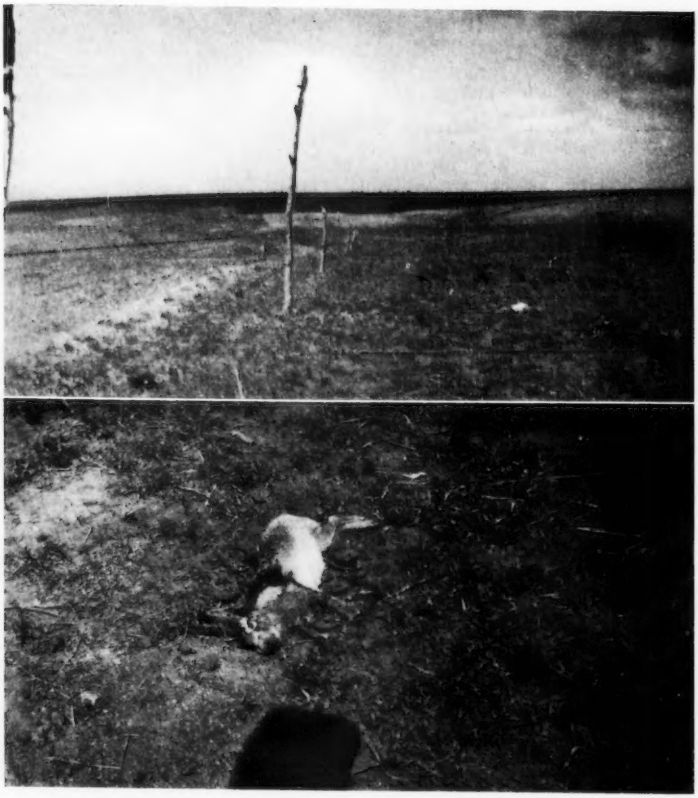

Figure 1 (upper). Picture of the pole upon which the trap is set, showing position of the rabbit bait on the ground to the right.

Figure 2 (lower). Rabbit as bait for hawks, with traps set around it as a means of taking birds of prey.

by the many specimens brought into the science room and observed in the field. This was the first time that mice had been common since the severe drouth of 1934. The *Microtus*, in particular, had been almost completely exterminated and is still rare.

The most successful set was prepared by selecting a fence on which hawks had been observed to be in the habit of perching, then placing a rabbit on the ground about ten feet from the fence and setting four traps closely around it, concealing them with dead grass or weeds. (Figs. 1 and 2.) Two hawks were caught around one rabbit at the same time by staking the chains of the traps on opposite sides of the bait so that one bird would not trip all the traps. Rabbits proved so attractive that they were the only bait used the second winter. In addition to the ground traps, two were set on nearby posts. The No. 1 jump trap will stay on a post without fastening if the post is flat-topped. Sometimes the posts were heightened by nailing together two two-by-fours of unequal length so that they were even at the upper end, the offset end was then fastened to the post by nailing through the longer piece. The trap chain was tied to the post above the level of the top fence-wire by a heavy cord just long enough to let the trap and captured bird touch the ground on either side of the fence. When this length of cord is used, it is impossible for the bird to move straight outward from the post and thus produce a solid jerk on the chain, because the trap must move through an arc. The bird is usually thrown off balance at each attempt to fly and it is seldom able to rise from the ground.

Such a set using two pole traps and four ground traps caught as many as five hawks in one week, and would no doubt have caught more if it could have been visited more often. Under our working conditions we were unable to look at the traps between eight o'clock in the morning and four o'clock in the afternoon except on Saturdays and Sundays, when they were visited about four times daily. Three hawks were caught in one set during one Saturday.

If an isolated pole is used, a wire can be run through the ring of the trap chain and one end stapled near the top of the post. The other end of the wire should be fastened as far above the ground as the length of the trap chain. When the bird is caught, the ring will slide down this wire and let the bird rest on the ground, but there will be no slack.

The most successful locations for sets were found to be on high ground with a good view of the immediate vicinity, but it was not necessary to have them far from the farm site. Some of the best locations were not more than 300 yards from farm buildings.

More birds were caught in the ground traps than in an equal number on posts. About one-fourth of the Buteos were taken on posts, but only one Marsh Hawk. Swainson's Hawks were usually

caught on the post sets, but the Rough-legged Hawks were almost invariably taken in the ground traps. Red-tailed Hawks were caught in both places in about equal numbers.

Of the 54 Buteos caught, only one, a Swainson's Hawk, sustained a broken leg, which we amputated. The bird ate well and was released after about a week. It flew well when released. About one-fourth of the large hawks caught would have the leg rubbed slightly, but very few had the skin broken. I believe the one Swainson's Hawk, was the only Buteo whose injuries would not heal quickly when released. Every large hawk, except two that got their wings muddy, was able to fly well when liberated. One American Rough-legged Hawk, caught November 16, 1936, had the leg skin broken and was bleeding; when recaptured seven days later, the old injury was scarcely visible. The injuries would be materially reduced if the traps could be more constantly attended.

Twenty-four Marsh Hawks were caught during the two years. Of this number there were five that had broken legs. Two more were twisted out of joint at the heel. Marsh Hawks are not as quiet in the traps as are the Buteos. It is my opinion that few were injured by the impact of the trap jaws, but that most of the birds broke their frail tarsi by their violent struggles after being caught. Two Marsh Hawks that were observed at the time of capture and immediately removed were not marked by the traps. A much lighter trap with about the same spread of jaws as the No. 1 is needed for this bird, but no trap of this sort is now available.

Four Sparrow Hawks were accidently caught while we were trapping for the larger birds. Two had broken legs. The other two were not hurt.

Our experience has proved that Marsh Hawks cannot be successfully taken in padded steel traps unless they can be visited often, and even then the injuries might run too high to justify this method of capture. Sparrow Hawks certainly should not be taken in this way.

Some method of preventing Marsh Hawks and Sparrow Hawks from tripping traps set for the larger hawks is necessary. I believe this could be done by fastening a spring or a piece of sponge rubber under the pan to make it harder to trip. Some experimenting on this plan is much needed.

One Prairie Falcon was caught and its leg was skinned considerably. It was recaught in good condition on the same post the following winter. This bird struggled violently each time it was approached in the trap.

With the padded steel traps one catch was made out of every three or four times a trap was sprung. I believe the reason for the trap being sprung so many times without catching is that the bird's

foot covers both the jaw and the pan of the trap and when the trap snaps the foot is thrown clear of the jaws. About 60 per cent of the Buteos were caught by the toes, and no doubt some caught in this way were able to pull out of the padded traps; however, this would not make the padded traps less useful in catching the harmful species, because they are mostly too small to be caught by the toes.

Four pole traps and two ground traps that operated by means of a steel wire spring which threw a chain around the birds' foot were used for two months during the winter of 1936–37. These were not as successful as the padded steel traps in making catches and the two American Rough-legged Hawks which were caught in these traps had their legs skinned quite severely—more than is usual in the padded steel trap. These foothold traps are relatively new and are now being extensively tested to find ways of improving them.

A recently patented jump trap that has the jaws covered with corrugated rubber was used late the second winter for a short time. An American Rough-legged Hawk and a Marsh Hawk were the only catches made in this trap, and both were in perfect condition. If some additional wrapping of the jaws is found necessary for the smaller hawks, it would be much easier than wrapping an ordinary steel trap. With the help of Richard H. Pough, a number of these traps were obtained through the National Association of Audubon Societies, and plans were made to give them a complete testing but snowstorms prevented their use before the writer was forced to give up the banding work in this area. It is believed that this trap will prove better than the padded steel trap, although it could be improved for bird use by using a thicker and softer rubber pad and by making the trap out of lighter material.

The methods described in this paper are far from perfect, but it is hoped that the information may be of help in working out better methods which will give fewer injuries. The writer will do no further trapping unless the traps can be more constantly attended or less harmful methods developed.

SUMMARY

1. Live, caged chickens were not successful bait for trapping birds of prey in this area.

2. Dead jack rabbits were the most successful bait. In regions where the cottontail is more abundant it could be substituted for the jack rabbit.

3. Well-padded steel traps proved very effective in taking birds of prey and, judging from the limited number of catches in this experiment, were not seriously harmful to the larger birds.

4. Trapping birds of prey was most successful in midwinter, when food was scarce.

5. Marsh Hawks showed too high a percentage of serious injuries to warrant taking them in padded steel traps. Most of the damage was believed to be due to the struggles of the bird against the heavy trap and not to the impact of the trap when sprung. For this reason the injuries may be greatly alleviated where it is possible to attend the traps closely. I feel certain that many of the injuries could be eliminated if a much lighter trap could be made without reducing the spread of the jaws. Such a trap would offer less resistance to the movements of the bird and decreases the harm done by its floundering after it is caught. Some method of keeping the smaller birds out of traps set for large hawks is necessary. This might be done by the use of springs or sponge-rubber pads under the trap pans. Some trap companies are working now to develop a steel trap for birds that will be both selective and harmless. The chain foothold trap is being extensively tested to find means of improving it. This work may soon produce the bird trap that we have been looking for—one that is effective as well as humane, and one that is ready to use when purchased.

NOTES ON HIPPOBOSCID FLIES[1]

By CARLTON M. HERMAN

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WHILE making a survey of the relative prevalence of blood parasites in our native birds at the Austin Ornithological Research Station on Cape Cod (Herman, 1938), numerous hippoboscid flies were observed. Certain of the larger species of these bird flies have been shown to transmit *Hæmoproteus*—a common malaria parasite of avian red blood cells. None of the smaller flies nor the infections of birds other than domestic pigeons, doves, and quail have been extensively studied. An effort has, therefore, been made to collect a number of the flies and to determine whether any relationship exists between the occurrence of these ectoparasites and the endoparasites of the blood. The present paper is mainly a list of the hosts which have been found infested with these flies at the Austin Station, with a few added remarks on their relative abundance on different species of birds and the rôle they may play in the spread of parasites among the avifauna. The author is indebted to Dr. J. Bequaert of the Department of Tropical Medicine, Harvard University Medical School, for suggestions and encouragement and for verifying the identification of a number of the flies.

[1] Contribution No. 28, Austin Ornithological Research Station, Cape Cod, Massachusetts.

The birds to be examined were taken into the laboratory for the purpose of making blood smears. At this time the bird was held for a brief period in front of a closed window while its feathers were ruffled vigorously. The flies thus flushed fly to the window, where they are easily captured in small vials. This method was first suggested by Mr. C. L. Whittle (Peters, 1930) and has proved to be the most satisfactory means of collecting them.

Two species of flies occur commonly on the Passeriform birds: *Ornithoica confluenta* and *Ornithomyia anchineuria*. They are unable to exist for very long when removed from a bird; the smaller species (*O. confluenta*) dies usually within forty-eight hours; the larger species may survive seventy-two hours (one fly remained alive in a gauze-covered vial for five days).

ORNITHOICA CONFLUENTA SAY

Ornithoica confluenta Say is a small fly which varies approximately from 2 to 2.5 mm. in length. It is characterized mainly by the fact that the third vein of the wing becomes confluent with the costal vein on the apical third (see Johnson, 1922). The following is a list of the host species from which this fly has been captured at the Austin Station:

FAMILY COLUMBIDÆ
Eastern Mourning Dove, *Zenaidura macroura carolinensis.*

FAMILY TYRANNIDÆ
Eastern Kingbird, *Tyrannus tyrannus.*

FAMILY MIMIDÆ
Catbird, *Dumetella carolinensis.*

FAMILY COMPSOTHLYPIDÆ
Northern Pine Warbler, *Dendroica p. pinus*
Northern Yellowthroat, *Geothlypis trichas brachidactyla*

FAMILY ICTERIDÆ
Eastern Red-wing, *Agelaius p. phœniceus*
Eastern Cowbird, *Molothrus a. ater*

FAMILY FRINGILLIDÆ
Red-eyed Towhee, *Pipilo e. erythrophthalmus*
Eastern Savannah Sparrow, *Passerculus sandwichensis savanna*
Eastern Grasshopper Sparrow, *Ammodramus savannarum australis*
Eastern Vesper Sparrow, *Poœcetes g. gramineus*
Eastern Chipping Sparrow, *Spizella p. passerina*
Eastern Field Sparrow, *Spizella p. pusilla*
Swamp Sparrow, *Melospiza georgiana*
Eastern Song Sparrow, *Melospiza m. melodia*

Specimens of this species of fly were collected by Mr. C. L. Whittle in Peterboro, New Hampshire, from Song Sparrows and from a White-throated Sparrow (*Zonotrichia albicollis*) and sent to the

author during the summer of 1936. None of the latter species have been examined for parasites at the Austin Station.

The above list gives no inkling of the abundance of this fly. With one exception, all the birds parasitized at the Austin Station were Passeriforms. Although over one hundred Mourning Doves have been carefully examined during the past two summers, only four of these birds have been found infested, three with one fly each and one bird with three flies. Only one Kingbird has been examined and it was found to be parasitized with three of these flies and one specimen of *O. anchineuria*. The most abundantly infected are the various Fringillids, particularly the Song Sparrows—individuals of which may commonly support six to eight flies. However, Cowbirds and Red-wings are also heavily parasitized, and the greatest number of *O. confluenta* taken from a single bird was 19 from a Red-wing.

ORNITHOMYIA ANCHINEURIA SPEISER

This species is about twice as large as *O. confluenta*. The body of this fly may be either brown or dark green in color. At the Austin Station it is the most common parasite on the Passeriform birds and has been taken from the following hosts:

FAMILY ACCIPITRIDÆ
Marsh Hawk, *Circus hudsonius*

FAMILY TYRANNIDÆ
Eastern Kingbird, *Tyrannus tyrannus*

FAMILY PARIDÆ
Black-capped Chickadee, *Penthestes a. atricapillus*

FAMILY MIMIDÆ
Catbird, *Dumetella carolinensis*

FAMILY TURDIDÆ
Eastern Robin, *Turdus m. migratorius*
Eastern Bluebird, *Sialia s. sialis*

FAMILY COMPSOTHLYPIDÆ
Eastern Yellow Warbler, *Dendroica a. æstiva*
Northern Pine Warbler, *Dendroica p. pinus*
Northern Yellow-throat, *Geothlypis trichas brachidactyla*

FAMILY ICTERIDÆ
Eastern Red-wing, *Agelaius p. pharniceus*
Eastern Cowbird, *Molothrus a. ater*

FAMILY FRINGILLIDÆ
Red-eyed Towhee, *Pipilo e. erythrophthalmus*
Eastern Savannah Sparrow, *Passerculus sandwichensis savanna*
Eastern Grasshopper Sparrow, *Ammodramus savannarum australis*
Eastern Vesper Sparrow, *Poaecetes g. gramineus*
Eastern Chipping Sparrow, *Spizella p. passerina*
Eastern Field Sparrow, *Spizella p. pusilla*
Eastern Song Sparrow, *Melospiza m. melodia*

Ornithomyia anchineuria occurs most abundantly on the Cowbirds at the Austin Station. As many as twenty-three of this species have been observed to fly from a single Cowbird, and between ten and twenty is common. In fact, during the month of August a Cowbird without at least one of these flies is indeed rare. It occurs nearly as abundantly on the Red-wings.

Adult birds are infested as well as the immature birds. Only in one case were hippoboscids observed on nestlings. In 1936 two Cowbirds removed from a Chickadee nest were parasitized with two of the flies apiece. The adult Chickadee was captured on its nest a few days later and a single fly was taken from its feathers. Although a number of Chickadees have been examined, this was the only one infected with hippoboscid flies. It therefore seems probable that the Chickadee is an abnormal host and that the bird found infected obtained its infestation through the parasitic nesting habit of the Cowbird. Although a great number of nestling Red-wings were carefully examined, no flies were observed on these birds.

LYNCHIA AMERICANA (LEACH)

This fly is much larger than the preceding species and has been taken mainly from hawks and owls. At the Austin Station two specimens were obtained in 1936 and two in 1937 from the following hosts:

Broad-winged Hawk, *Buteo p. platypterus*
Great Horned Owl, *Bubo v. virginianus*

LYNCHIA ALBIPENNIS SAY

Only one specimen of this species has been taken from a bird at the Austin Station. This was collected in 1933 by Dr. O. L. Austin, Jr., from an adult Black-crowned Night Heron, (*Nycticorax nycticorax hoactli*).

PREVALENCE

Ornithomyia anchineuria is by far the most common fly on the birds at the Austin Station. It has been observed on both adult and young birds but is much more numerous on the younger birds. Cowbirds and Red-wings are much more heavily parasitized than any of the other species of birds. *O. confluenta* is most abundant on the Song Sparrows but occurs on the other Fringillids, Cowbirds, and Red-wings quite frequently. The flies have been taken as early as June 6th and as late as September 15th but are most abundant in the last week in July and during the month of August. During August, 1937, the hippoboscids were much more numerous than they had been at the same time in 1936. Mr. Whittle informs me that the reverse has been true with the birds he has trapped in Peterboro, New Hampshire. In 1937 there was practically no rain

during July on Cape Cod, while in New Hampshire there was more rain in July, 1937, than there was the previous year. Perhaps the hippoboscid flies thrive better in a drier atmosphere.

PHORESY

A number of investigators have suggested that hippoboscid flies may serve to disseminate other ectoparasites among the birds. Several cases have been reported of hippoboscids with Mallophaga attached to their abdomens, as evidence that these flies serve to spread the feather lice among the avifauna. Of a great number of flies collected and carefully examined at the Austin Station only one (Herman, 1937) has carried Mallophaga. It can therefore be concluded that hippoboscids are not an important factor, at least on Cape Cod, in the dissemination of bird lice.

PARASITISM

Some of the hippoboscids collected from birds at the Austin Station have been parasitized by sarcoptid mites. This family of mites are characteristically ectoparasites of mammals, but a single subfamily — *Myialgesinæ* — has been reported as parasites of hippoboscid flies. They were first described from a fly collected in Africa by Sergent and Trouessart in 1907. They have been reported from this country in California by Ferris (1928), who observed the mites on *Ornithoica confluenta* and also on flies collected in the Philippine Islands. At the Austin Station these mites have been observed on both *Ornithoica confluenta* and *Ornithomyia anchineuria*. They have been most abundant on *Ornithomyia anchineuria* collected from Cowbirds, but also have occurred infrequently on both species of hippoboscids collected from other birds.

There is a question as to whether these mites are true parasites of the hippoboscids or are merely using the flies in a phoresic nature, as is the case with the Mallophaga. However, they have been reported only from hippoboscid flies and are not known to parasitize birds. Ferris pointed out that the mites leave a scar when removed from a fly. Nothing further is known of the biology of these mites. At the Austin Station they did not appear on the flies until late in August. The hippoboscids are much less abundant in September, but whether the parasitic mites have anything to do with the reduction is not known.

SUMMARY

Ornithoica confluenta is reported from fifteen species of birds at the Austin Ornithological Research Station and was observed to occur most frequently on Song Sparrows and other Fringillids. *Ornithomyia anchineuria* is listed from eighteen species of birds. It is very common on Cowbirds and Red-wings. Two species of

birds were found to be parasitized by *Lynchia americana*, and one specimen of *Lynchia albipennis* was collected from a Black-crowned Night Heron. Hippoboscids were found to be most prevalent on the Cowbirds. Both adult and young birds are infested. The flies are most abundant during late July and the month of August. It is suggested that the hippoboscids thrive best in a dry atmosphere.

Mallophaga were observed on only one hippoboscid of a great many examined. It is therefore concluded that phoresy as a means of dissemination of ectoparasites of birds by hippoboscids is not an important factor on Cape Cod. Parasitic sarcoptid mites of the subfamily *Myialgesinæ* are reported from *Ornithoica confluenta* and *Ornithomyia anchineuria*.

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WEIGHTS OF SOME BIRDS OF PREY OF WESTERN KANSAS

By RALPH H. IMLER

Introduction

LOCALITY. The following weight records of 112 birds from Rooks County, Kansas, were obtained during fall and winter months from September, 1935, to February, 1937. Most of the data are from live birds that were trapped for banding but some records are from specimens collected for study skins or found dead along the roadside by students of the Stockton (Kansas) High School. Dead birds were weighed only if in fresh condition.

TECHNIQUE. Spring balance scales of 2000 gram capacity were used for taking most of the weights. The eagles and the largest hawks were weighed on a Chatillon milk scale which was read to the nearest one-twentieth pound, and the readings were computed in grams. Sparrow Hawks and small owls were weighed on platform balances. All scales used were regularly tested for accuracy.

Notation was made of the weight of crop and stomach contents of dead birds when it exceeded five grams. Live birds' crops were examined externally, and estimates are given of the weight of the contents of those that contained noticeable food. Ability to make these estimates fairly accurate was developed by practicing on dead birds. Since the live birds were usually in the traps for some time before they were weighed, there were few that had discernible food in the crop. One American Rough-legged Hawk was observed feeding on the dead rabbit used as bait while it was caught by one foot. It is believed, however, that birds of prey seldom feed while held by a trap because the crops of those taken in this study were usually empty, even when plenty of food was within easy reach.

Sex of live birds is given when plumage or measurement made determination reasonably accurate. It is omitted in the live records of the American Rough-legged Hawk.

WEIGHTS

Turkey Vulture (*Cathartes aura septentrionalis*).
Two live birds: Sept. 21, 1936, 1670 gm.; Sept. 22, 1612 gm.

Eastern Red-tailed Hawk. (*Buteo borealis borealis*).
Live male, Oct. 2, 1935, 820 gm.
Three live females: Oct. 14, 1935, 1235 gm.; Oct. 19, 1936, 1451 gm. (crop contents estimated 50 gm.); Nov. 9, 1936, 1433 gm.
Two immatures: Oct. 8, 1935, 909 gm.; Oct. 1, 1936, 865 gm.
Dead female, Oct. 30, 1935, 1147 gm. (crop contents estimated 80 gm.).
Average weight of seven birds is 1123 gm.

Harlan's Hawk. (*Buteo borealis harlani*).
Live female, Nov. 24, 1936, 1629 gm.

Swainson's Hawk. (*Buteo swainsoni*).
Live male: Sept. 30. 1936, 710 gm.
Two live females: Sept. 29, 1936, 1055 gm.; 1145 gm.
Three live birds (sex undertermined): April 28, 1936, 1015 gm. Sept. 23, 1937, 1120 gm.
Three dead males: Sept. 29, 1935, 1060 gm. (crop and stomach contained 56 gm. of grasshoppers); 1062 gm. (crop and stomach contained 53 gm. of grasshoppers); April 15, 1936, 892 gm. (stomach contained 36 gm. of food).
Dead females: Sept. 29, 1935, 1067 gm. (immature); May 1, 1936, 1245 gm.
Average weight of 10 birds is 1037 gm.

American Rough-legged Hawk. (*Buteo lagopus s. johannis*).
Live birds: Nov. 12, 1935, 885 gm. (immature); Nov. 25, 1130 gm.; 8 birds Dec. 7 to 28, 1935, 910 gm. (immature); 1205 gm.; 1245 gm.; 1420 gm. (dark phase); 1420 gm. (estimated 90 grams of food in crop); 1062 gm.; 1270 gm.; 1065 gm.; 6 birds Jan. 3 to 27, 1936, 1245 gm.; 1065 gm.; 890 gm. (immature); 1290 gm.; 1495 gm. (estimated 70 grams of food in crop); 1320 gm.; Oct. 19, 1301 gm.; 5 birds Nov. 5, to 25, 1936, 1274 gm.; 956 gm.; 1188 gm.; 1347 gm.; 1269 gm.; Dec. 11, 1936, 1333 gm.; Dec. 14, 1192 gm.
Dead male, Oct. 28, 1935, 1023 gm.
Dead female, Nov. 25, 1935, 1432 gm. (crop and stomach contained 212 gm. of rabbit, 31 gm. of grasshoppers, and 6 gm. of the remains of a Lapland Longspur.
Average weight of 26 birds is 1200 gm.

Ferruginous Roughleg (*Buteo regalis*).
Live males: Nov. 16, 1935, 1332 gm.; Nov. 10, 1936, 1142 gm.
Live females: Nov. 16, 1935, 1816 gm.; Jan. 20, 1936, 1961 gm.
Live birds (of intermediate measurements): Nov. 16, 1935, 1475 gm. (when recaught Nov. 6, 1936, this bird weighed 1447 gm.); Jan. 3, 1936, 1415 gm.
Dead female, Jan. 27, 1936, 2172 gm. (very fat).
Average weight of seven birds is 1619 gm.

Golden Eagle (*Aquila chrysaetos canadensis*).
Live male weighed 4323 gm. two days after being shot and crippled by a farmer, Oct. 29, 1935. The wound healed in captivity, and two months later the bird weighted 4664 gm.

Bald Eagle (*Haliæetus leucocephalus leucocephalus*).
Live immature, Dec. 17, 1935, 4550 gm.
Two dead males: Jan. 20, 1936, 5970 gm.; Jan. 15, 1937, 5715 gm.
Two dead females: Feb. 15, 1934, 6143 gm.; Jan. 1933, 6484 gm. (crop and stomach contained 364 gm. of rabbit).
Average weight of five birds, 5772 gn.

Marsh hawk (*Circus hudsonius*).
Five live males: Oct. 27, 1935, 401 gm.; Dec. 10, 1935, 365 gm.; Dec. 19, 385 gm.; Nov. 6, 1936, 423 gm.; Dec. 24, 441 gm.
Twelve live females: Dec. 1, 1935, 510 g.; 4 birds Jan. 6 to 27, 1936, 605 gm.; 590 gm.; 505 gm.; 525 gm.; Oct. 27, 1936, 551 gm.; Oct. 30, 605 gm.; 3 birds Nov. 10 to 24, 1936, 614 gm.; 601 gm.; 587 gm.; Dec. 14, 1936, 569 gm.; 601 gm.
Three immature birds (sex not determined): Sept. 22, 1936, 465 gm.; Nov. 5, 1936, 537 gm.; Dec. 21, 1936, 528 gm.;
Average weight of twenty birds, 520 gm.

Prairie Falcon (*Falco mexicanus*).
Live female, Dec. 11, 1935, 885 gm.
Dead female, Feb. 22, 1936, 680 gm. (poor condition).

Sparrow Hawk (*Falco sparverius sparverius*).
Two live males: April 28, 1936, 109 gm.; Nov. 22, 1936, 124 gm.
Two dead males: Sept. 24, 1935, 106 gm.; Oct. 3, 1935, 127 gm.
Dead female, May 20, 1935, 140 gm.
Average weight of four males is 117 gm.

Barn Owl (*Tyto alba pratincola.*)
Live bird, Sept. 30, 1936, 475 gm.

Screech Owl (*Otus asio subsp.*).
Dead female, Dec. 24, 1936, 189 gm. (very fat, crop contained 11 gm. of food).
Three dead bird' (not sexed): Feb. 17 to 27, 1936, 146 gm.; 126 gm. (poor condition); 145 gm.
Average weight of 4 birds, 152 gm.

Great Horned Owl (*Bubo virginianus subsp.*).
Three live males: Oct. 15, 1935, 1360 gm.; Mar. 10, 1936, 1230 gm.; Oct. 16, 1936, 1256 gm.
Seven live females: Oct. 2, 1935, 1543 gm.; Nov. 26, 1935, 1610 gm. Nov. 16, 1936, 1519 gm.; four birds Dec. 9 to 17, 1936, 1551 gm.; 1505 gm.; 1529 gm.; 1652 gm.
Dead male, Feb. 22, 1936, 1230 gm.
Two dead females: Nov. 17, 1935, 1544 gm.; Mar. 23, 1936, 1580 gm. (contained 23 gm. of food in stomach).
Average weight of 13 birds, 1470 gm.

Burrowing Owl (*Speotyto cunicularia hypogæa.*)
Five live birds: Aug. 19, 1935, 161 gm.; Sept. 30, 1935, 148 gm.; Oct. 1, 1935, 171 gm.; 155 gm.; Oct. 6, 1936, 114 gm.
Two dead males: Sept. 27, 1935, 148 gm.; Sept. 30, 1936, 148 gm.
Average weight of seven birds is 149 gm.

Short-eared Owl (*Asio flammeus flammeus*).
Dead bird (not sexed), Nov. 7, 1935, 270 gm.

CONCLUSIONS

Three of the seven Burrowing Owl weights were identical, but those of the remaining four varied from 114 to 171 grams. The Great Horned Owl showed a fairly uniform weight for each sex, with a difference of 145 grams between the heaviest male and the lightest female. This apparently could be used as a means for the separation of sexes of this species. However, this characteristic was not observed in hawks, which showed a wide variation in weights of apparently normal birds of the same sex and species. One male Swainson's Hawk weighed 710 grams, and another, which contained 53 grams of food, weighed 1062 grams. The greatest proportional difference in extreme weights of opposite sexes within a species was in the Ferruginous Roughleg. One male in good condition weighed 1142 grams. A fat female, with crop and stomach empty, except for a few grams of rabbit remains, weighed 2172 grams—nearly twice as much as the male.

The question has been raised whether trapped birds weigh less than birds collected by shooting. The average weight of the live birds was found to be about the same as the average weight of the dead less the weight of their food contents. From this fact it is apparent that the loss of weight while the bird is in the trap is not great if the traps are visited night and morning or oftener.

There were not enough data obtained in this study to give a definite conclusion as to what the average food contents of a species in this area will weigh. One American Rough-legged Hawk weighing 1432 grams had 249 grams of food in its crop and stomach, or 21 percent of the body weight! Two male Swainson's Hawks with stomachs gorged with grasshoppers contained food equal to about 5 percent of their body weight, and even this percentage is above average for food contents of winter-taken birds of prey in Western Kansas.

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A STUDY OF HUMMINGBIRD BEHAVIOR DURING A NESTING SEASON

By CHARLES L. WHITTLE

EQUIPPED with a spring balance, reading to one half gram by estimation, and several cylindrical glass flower-containers placed within five to fifteen feet of the house, I have been able to study the habits of the Ruby-throated Hummingbird (*Archilochus colubris*) during the 1937 nesting season at close range.

The accuracy of the balance was carefully tested by using standard metal weights. The liquid containers for the syrup were found to be essentially of equal diameter for their entire length, and when full that they held two grams of syrup, thus affording a means of estimating approximately the weight of the contents eaten by the birds when desirable. The pan on the balance was replaced by a horizontal twig to which a red Packard feeder was attached. The twig was often used as a perch for the Hummers while they fed from the container. With binoculars it proved easy to read the bird weights with accuracy. The location of the balance and the feeders, six in number, close to the house served to bring the birds so near that exceptional opportunity was afforded to observe their behavior prior to nest building, during their courting and nidification and after the young left the nest. Two pairs at least nested near the house, with the result that one or more birds were usually feeding from the containers or flowers from early morning till nearly dark, the attendance becoming less as the season advanced and the flowers increased. The males in particular became less attentive beginning with the appearance of young Hummers about the middle of August.

ACTIVITIES PRIOR TO AND DURING NESTING TIME

The first Hummer to arrive at the station was a male arriving on May 17th. He at once visited a feeder, but was not seen again, probably moving northward in migration. On May 21st a second male appeared and he too visited a feeder immediately. He then began a long vigil lasting until May 30th, believed to be a search for a female. This vigil took place from three observation posts overlooking a circular flower garden, one on an aerial, one on a dead branch of an elm, and a third on a dead twig at the top of an apple tree, all these perches being from fifteen to twenty feet from the ground. For the major portion of each day he occupied these perches, moving from one to another, and while perching he continually moved his head from side to side through an arc of 60–70 degrees. One cannot well escape the conclusion that he was searching for a female, since the habit was immediately discontinued upon

the arrival of a female at the station on May 30th. Now, for a period of about a month, his attention was directed to the female and consisted of the usual zooming before her whenever she appeared at the feeders and no doubt elsewhere. During this period two or more females and another male (a late arrival) visited the feeders many times daily. Now there were two zooming males in place of one. The females paid not the slightest attention to the advances of the males, and this lack of attention continued up to about July 1st, when their attitude towards the males underwent a complete change. On July 2d a male and a female were seen facing each other in the air about eight to ten inches apart, ascending and descending vertically to a height of about ten feet, and occasionally dropping to the ground for a moment. At other times their flights were more or less spiral in character, and such exhibitions were frequent up to July 7th, when Mrs. Whittle observed a pair drop to the ground beside our driveway, where copulation took place. From this time on the males were seen zooming only occasionally, and vertical flights ceased entirely after the first week in July. It is naturally assumed that this behavior was coincident with the duration of the egg-laying period.

Early in August the males' attendance at the feeders was noticeably less (owing partly, no doubt, to the increase of their favorite flowers), and by August 10th several days would pass without a visiting male being seen. In the meantime the females divided their attention between the feeders and the flowers.

By August 27th Hummers were becoming scarce. On the 28th and 29th none was seen. On the 30th one, evidently a migrant, passed through. None was seen on the 31st, or on September 1st or 2d, but on the 3d another was seen for a moment.

REGARDING MATING

The voluminous literature on Hummingbirds, covering many aspects of their life-history, is singularly deficient in the details of the behavior of mated pairs. The paucity of recorded cases of a male visiting the nest during incubation or during the feeding of the young in the nest is especially striking. During personal observations for a period of four nesting seasons. I have never noted the presence of an adult male in the two maples where at least one pair has nested each year.

Mating, in the ordinary sense of the word, that is, pairing off well in advance of nest-building and continuing during nidification and raising of the young birds, as far as any evidence observable at this station is concerned, appears not to take place. No preference for a male on the part of a female is indicated until *just prior to egg-laying*, a period seemingly of three or four days. I have found no

evidence that a male's interest in a female one day is manifested towards the same female the following day. All the pretty ways common among many species of mated pairs, often lasting two months at least, are entirely lacking among Hummingbirds. The male appears to be a free lance whose intimate interest in the female is confined to the short period just before and during egg-laying.

Flying Speed

During this nesting season (1937) for the first time in my experience an opportunity occurred to get an estimate of a Hummingbird's flying speed. This occurred in the following way: A straight driveway about two hundred and fifty feet in length extends from the highway to the house. On one occasion I was sitting within ten feet of the driveway when a pair of Hummers came over the house about one foot apart and crossed the driveway, very close to me, to a field. I noticed that they were swinging around so as to reenter the driveway. This they did, and then followed it back and over the house again, a measured distance of two hundred and ten feet. The time required to fly this distance was slightly under two seconds Calling the time two seconds, they flew at the rate of seventy-one miles per hour. At best this is an estimated speed, but I feel sure their real speed was over, rather than under, that figure.

Hummingbird Weights

Using the balance above described, several dozen weighings of adults of each sex were made during a month's time and at all hours of the day. Of the total weighings of males made, only two were of three grams, and of females only two were of two grams. One male also weighed two grams, but fully ninety per cent of the weighings of both sexes gave two and one half grams, and this is doubtless their average weight. The high readings were probably due to recent feeding on the heavy syrup, and the low readings to early-morning weighings when the alimentary tract was quite empty.

Several weighings of very young birds (sexes not known) were made, and they were found to weigh close to two grams. It was noticeable, however, that, while the adults showed no evidence of molt, the plumage of the young birds was less trim and was manifestly not completely grown. One had a dark throat-patch where the natal down still showed, the same bird also having a prominent whitish spot at the base of the upper mandible that possibly may be a remnant of the egg-tooth.

Commonly the birds fed from the feeders for only a moment at a time, but occasionally one would take a long, uninterrupted drink. On one occasion a female during fifteen seconds consumed one-half gram of syrup.

1936 MIGRATION NOTES

During the first week of September, 1936, a migration of Hummers was easily observed. At that time there were several hundred gladioli in bloom close together, forming a conspicuous patch next a field on the south. During this period the feeders were in place as usual, but flowering plants visited by these birds were scarce. Each day females or young Hummers from the north came singly or in twos and, rarely, in threes, and fed from the gladioli, stopping only a moment usually but occasionally for two or three minutes. They then in each instance flew swiftly southwesterly across the field. None of the birds visited the feeders.

It is thought probable that this is the usual manner of migration, at least in New England, the birds lingering at places where flowers occur conspicously, but moving rapidly across less promising terrain.

REPORT ON THE COÖPERATIVE HERRING GULL PROJECT

Station	*Number Banded**	*1937 Color Combinations****	*Bander*
Kent's Island, N. B.	2,350	Survey band over one red band	W. A. O. Gross and N. R. Pillsbury, Jr. (Bowdoin Scientific Station)
Labrador Coast	300**	Survey band over one yellow band	Harold S. Peters (U. S. Biological Survey)
Isles of Shoals, N. H.	500	Two red over Survey band	L. O. Shelley (N. E. Bird-Banding Association)
Razades Islands, Que.	727	Two blue over Survey band	D. A. Déry (Provancher Society)
Bonaventure Island, Que.	100	Two yellow over Survey band	William Duval
Wicopesset Island, N. Y.	75	Survey band over red over blue	W. C. O'Brien (Nat'l. Assoc. of Audubon Societies)
St. Mary Islands, Que.	505	Survey band over red over yellow	H. F. Lewis (National Parks of Canada)
Penikese Island, Mass.	500	Survey band over blue over red	L. B. Fletcher (N. E. Bird-Banding Association)
Heron Islands, Me.	700	Blue over yellow; Survey band on opposite leg	Stanley Hyde (N.E. Bird-Banding Association)
Muscongus Bay, Me.	683	Survey band over yellow over blue	A. D. Cruickshank (Nat'l Assoc. of Audubon Societies)
Total	6,440		

ROBERT P. ALLEN

*All birds were fledglings except 200 adults at Kent's Island, which have an additional black band on opposite leg.
**Unofficial.
***Bands are on either leg.

GENERAL NOTES

At What Time of Day do Birds Feed?—During the spring migration of 1937 I made an attempt to determine the time of day at which birds feed.

One hundred and eighty birds of eighteen species were trapped a total of three hundred and thirty-seven times in an area of not more than fifty square yards. Five traps were used as follows: A, Lyon improved sparrow trap; B, pullstring drop trap; C, Higgins 2-cell midget, false-floor type; D, small Glenhaven sparrow trap; E, Canary cage trap, false floor.

For convenience the time of capture has been divided into four periods: Period 1, from dawn to 8:00 A.M.; period 2, from 8:00 A.M. to 1:00 P.M., period 3, from 1:00 P.M. to 5:00 P.M.; period 4, from 5:00 P.M. to dark. This gives a fair distribution of the day, early morning, mid-morning, mid-afternoon, and evening.

The table below shows the times of visit to the traps of several species, together with the number of takes in each trap at each period.

	Period 1	*Period 2*	*Period 3*	*Period 4*	*Total*
Total times trapped	68	120	52	97	337
Trap A	19	31	21	32	103
Trap B	5	4	3	7	19
Trap C	16	35	14	20	85
Trap D	18	37	13	17	85
Trap E	10	10	8	14	42
Slate-colored Junco	10	27	16	15	68
Field Sparrow	13	11	9	17	60
Catbird	1	1	3	..	5
Blue Jay	7	3	2	2	14
White-throated Sparrow	17	17	10	27	71
Water-Thrush	1	3	1	..	5
Cowbird	2	18	4	1	25
Song Sparrow	6	12	6	6	30
Lincoln's Sparrow	1	3	..	4	8
Cardinal	4	1	..	1	6

The foregoing seems to indicate a tendency to feed during period 2, with period 4 as second choice and period 3 as the low point in feeding—probably indicating a rest period at that time.

The above seems unusual in that one would expect the birds to be extremely hungry after a long night flight or a night spent in strange surroundings. Period 4 seems right as second choice, as there should be a tendency to feed before retiring. As the period of light before 8:00 A.M. is extremely small, it is possible that it takes the birds a little time to locate and work their way to the food-supply at the traps, thereby establishing period 2 as the choice through circumstance rather than habit.

The variation of time of capture in individual traps does not indicate anything more than the effectiveness of traps of a certain type and their proper location for certain species.

White-throated Sparrows were taken more in period 4, while Slate-colored Juncos were taken more times in period 2. As these two species are usually found feeding together, it seems strange that there should be a variation in the periods of feeding.

Lincoln's Sparrows and Field Sparrows were both taken in greatest numbers in period 4. As these two species are of retiring habits it seems right that they should be at the traps before anyone is out around the station to frighten them away. Two Cardinals trapped six times were taken four times in the early mornings.

The number of individuals showing a set time for feeding is surprisingly small, as the following will indicate. Field Sparrow 37-36958, which was trapped twenty times, was taken five times in period 1, four times in period 2, six times in period 3, and five times in period 4. Song Sparrow 37-118711 was trapped four times in period 1, five times in period 2, once in period 3, and four times in period 4.

The following table will indicate the number of individuals trapped more than once in any one period.

	Number of times trapped in any one period				
	2 *times*	3 *times*	4 *times*	5 *times*	6 *times*
Number of individuals	16	3	3	2	3

Eighteen other individuals were trapped two or three times; each time in a different period.

CONCLUSION

I realize that the above does not offer a solution of the problem of the times of feeding of birds as a group or of any individual, but rather suggests a problem and a method of approach for bird-banders with a limited amount of time to devote to investigation. I understand that there are other papers on this subject, but I have never been fortunate enough to run across them and so do not know what conclusions, if any, have been reached. This was attempted as a means of broadening my banding work and adding more interest to banding and releasing a bird. The figures are not large and therefore are not expressive of the country as a whole or even of this particular section. No attempt was made to register weather conditions or take them into consideration in this experiment. I only hope that other banders will consider doing some work along these lines, as I am convinced that it will bring many hours of interesting and profitable recreation. Louis G. Flentge, Box 68, Wheeling, Illinois.

A Six-Year-Old Bank Swallow.—One of the interesting and valuable contributions that banding has to offer in furthering human knowledge about birds relates to the length of life-span. Until recent years little definite information regarding longevity in our native birds has been available. But with the recovery as returns of more than 150,000 individuals banded under the sponsorship of the United States Bureau of Biological Survey in the last seventeen years, considerable light has been thrown on this subject.

For the past several years the present authors have been more or less concentrating their banding activities on the Bank Swallow (*Riparia r. riparia*). Our first efforts, undertaken at Lake Okoboji, Iowa, in 1923, terminated in 1927. We resumed banding activities at Oneida Lake, New York, in 1928 and have continued operations there through the current (1937) season. In addition, beginning with the season of 1933, we have conducted banding studies on this bird at Albany, New York.

In these three localities we have banded to date a total of 5576 young and adult Bank Swallows. Of the 4217 individuals presumed to have been available for returns during our last season of field work in the three localities mentioned, 147 (3.4 per cent) actually have been recovered as such.

For present purposes a period of at least eight months must have elapsed between the date of banding and the date of recovery in order that the bird be considered a return. Presumably, too, each return bird has made one or more round-trip journeys between the nesting grounds and the winter quarters.

Among all these returns only one individual has attained a known age of as much as six years. A brief account of this bird's history may be of interest.

Juvenal Bank Swallow No. F 55586, one of a family of four, was banded from a burrow in the south bank of Fish Creek near Oneida Lake, New York, June 30, 1931. On May 22, 1937, it was recovered as a laying or incubating bird from a burrow in the north bank of Fish Creek about half a mile northeast of the site of its natal burrow and the point of banding. The burrow was 36 inches deep and 16 inches below the turf, and contained an unlined grass nest.

The body-temperature of this bird registered 109.8° Fahr. at the moment of recovery, and its weight was 13.3 grams. All indications pointed to the fact that this was an egg-spent female. Its mate, weight 15.5 grams, also was banded.

Since No. F 55586 was about fifteen days old when it was banded, at the time of recovery it, therefore, lacked some twenty days of having attained the age of six years. This is our oldest known Bank Swallow and, so far as we are aware, the oldest recorded individual of this species. After having presumably made six round-trip journeys between its summer home and its winter quarters, this swallow returned to nest in the *general locality* of its nativity but *not in* that colony. None of the other members of its immediate family ever have been recovered.—DAYTON STONER, New York State Museum, Albany, New York, and LILLIAN C. STONER, Albany, New York.

A Northern Flicker's Unusual Manner of Bathing.—During a recent dry period of several weeks' duration, unbroken by thunder-storms, my bird-bath has been of great attraction to local birds. An occasional Blue Jay, Bronzed Grackles, Robins, and Starlings have bathed so frequently that the bath required filling twice daily. In the morning and evening when the sprinkler has been in operation, the birds are particularly abundant. The signal for their appearance is the running water shot into the air. The Robins in particular gather in small numbers.

The unusual action of a Flicker (*colaptes auratus luteus*) and its method of bathing is of interest. One evening, when the sprinkler was in use, and so placed that some of the water dropped in the bath, a Flicker was attracted and came to bathe. I had never seen this species use the bath, except to drink from it. This particular individual lighted on the lawn at the foot of the bath, which is mounted on a pedestal about three feet high, opened its wings, and fluffed out its feathers. In this position it faced the sprinkler for a few moments with drops of water falling over it, and then began to hop slowly through the wet grass as close to the earth as it could move, with wings and tail spread. The bird continued this action until it had apparently bathed sufficiently from the water on the grass and drops from the sprinkler and then flew to a nearby tree. Its flight was labored, as though the soaking had been complete. It ignored the water in the bath apparently preferring to bathe in the described fashion.—CHARLES B. FLOYD, Auburndale, Mass.

Some Brown Thrasher Returns.—At my station in Amherst, Massachusetts, there have been two Brown Thrashers (*Toxostoma rufum*) of interest, one an immature bird and the other an adult. Details are as follows:

B-247057, adult, banded July 14, 1933.
A Return-1 May 21, 1934, repeating June 1st, 6th, 11th, 15th, and 16th.
A Return-2 August 8, 1935.
A Return-3 June 17, 1936, repeating June 18th, 19th, 21st, and 28th.
A Return-4 June 21, 1937. This bird was also at least five years old on the last date of return.

A-298946, immature, banded August 19, 1932.
A Return-1 May 15, 1934, repeating May 20th and 29th, June 4th, 9th, 10th, 13th, 14th, 15th, 20th, and 28th, and July 3d.
A Return-2 May 17, 1935, repeating May 23d and June 8th.
A Return-3 May 16, 1936, repeating May 17th, 20th, June 17th, 20th, 27th, and 28th, and July 1st.
A Return-4 May 20, 1937, repeating June 17th and 25th. This bird was five years old when last trapped.

MRS. FREDERICK MORSE CUTLER.

Yellow Warbler Return.—A Yellow Warbler (*Dendroica æ æstiva*) was taken in a net and banded as an adult May 28, 1931, at the Austin Ornithological Research Station, North Eastham, Cape Cod, Massachusetts, by Mr. John M. Conkey. It was retaken in the same manner May 15, 1932, May 18, 1936, and August 6, 1937. Captures show that this species has been several times more abundant on the station land this season than usual, also that chick survival usually minimized greatly by cowbird parasitism, has been uncommonly high. —O. L. AUSTIN, North Eastham, Cape Cod, Massachusetts.

A Correction

In *Bird-Banding* for April, 1937, p. 60, Wren-Tit 91519 was stated to have been banded on March 22, 1935. This should read 1925.—MAY THATCHER COOKE.

RECENT LITERATURE

(Reviews by Margaret M. Nice and Thomas T. McCabe)

The articles have been selected and arranged under subjects of importance to students of the living bird, and also for the purpose of suggesting problems, or aspects of problems, to those banders who wish to make the most of their unique opportunities.

Headings in quotation marks are the exact titles of articles or literal translations of such titles. Except in the case of books, which are always reviewed under their titles, headings not in quotation marks refer to general subjects, or are abbreviated from titles in foreign languages. References to periodicals are given in italics. Reviews by Mr. McCabe are signed with his initials.

MIGRATION EXPERIMENTS

"The Influence of External Factors on the Daily Rhythm during the Migratory Phase."[1] The migration restlessness of a number of birds caught at Heligoland was tested in recording cages in relation to hunger, temperature, and light. It was found that sparingly fed birds were much more restless at night than those that had been well fed; that low temperature stimulated the restlessness in the fall and high temperature inhibited it; and that both bright light and absolute darkness induced quiet. The most favorable light for migratory activity for the Redbreast (*Erithacus rubecula*) was one-twelfth "meter candle".

"The Physiology of the Migratory Instinct. III. Experiments with Artificially Lengthened Daylight."[2] Four young Redbreasts captured on Heligoland were given additional light from January 18th to May 12th, while four others were kept as controls. Some migration restlessness was shown in February by the irradiated birds, but almost none by the controls; by March 8th the experimentals came fully into the migratory phase, followed in a few days by the controls. The experimentals stopped in late April, but the controls continued. Both sets of birds started singing February 8th, but the lighted birds stopped in late April, at which time two of them started to molt, one control following suit May 8th. On May 12th the controls had large gonads, but those of the experimentals were in the resting stage. All the birds were kept in rooms only slightly heated.

Four adult male Redstarts (*Phœnicurus phœnicurus*) caught September 10th were given increasing amounts of light from September 19th to December 12th; this treatment had *no effect on the gonads* nor on the migration restlessness. But a male that entered the experiment on November 12th showed some increase of gonads and decrease of restlessness. Six male Redstarts given extra light from April 5th to July 2d came into molt on June 13th, while the controls did not do so until August 4th.

"On the Relationship of the Course of Migration to the Endocrine Glands."[3] Lesser Black-backed and Black-headed Gulls (*Larus fuscus* and *ridibundus*) that were castrated at Rossitten were later recovered on the normal fall migration route. Seventeen Redbreasts were captured in the fall migration; some of these were lighted for several hours each evening from November 24th on, but their gonads a month later were no different from those of the controls. On March 7th, however, an experimental bird had a testis 423.5 cu. mm. in size, while those of controls were 7.78 and 10.4 cu. mm. The lighted birds started migration restlessness and calls March 23d, the controls not until April 17th, while the first migrant of the season was noted March 26th. The testes of a migrant on April 3d measured 19 cu. mm. and of another on April 17th 148 cu. mm. Rooms entirely unheated.

Hooded Crows (*Corvus cornix*) and Gulls (*L. fuscus* and *canus*) were also subjected to light; on February 1st adults showed enlarged gonads, but young Gulls were unaffected. The relationship of the thyroid gland to migration is discussed, and the conclusion is drawn that it is impossible to judge from sections of the thyroid and gonads as to the migratory stage of an individual bird.

"Effects of Traffic Disturbance and Night Illumination on London Starlings."—William Rowan. 1937. *Nature*, 139:568. The author's experiments on the effects of lengthened periods of exercise in dim light on gonads of *Junco hyemalis* outside of the breeding season have been repeated and the former results confirmed. From January 4th to February 28th some of the birds were kept awake for seven and one half minutes longer each night, while the controls slept in an adjoining cage. Testes of the former were considerably enlarged, while those of the controls remained at the winter minimum. Starlings that roosted in London over main traffic routes were kept awake for hours each night by "the din and tumult below them." A dozen birds collected here February 10th showed enlarged testes, in contrast to small testes of country birds taken at the same time. The light at the London roost was too dim to be registered at all by a Weston lightometer.

With Dr. Rowan's introductory sentence the reviewer must disagree on several points. He says, "That the breeding period of birds with a relatively brief annual reproductive season could be shifted to any time of the year by manipulating lighting conditions, regardless of temperatures, was first shown in 1924."

So far as the reviewer is aware, very few birds have been induced to *breed* through the manipulation of lighting. This was true of Cole's Mourning Dove. (*Auk*, 1933, p. 284), but at a *temperature of* 70° *F.* Turkeys mated and laid in January instead of March in response to night-lighting (temperature not mentioned), but no effects were obtained with Guinea-fowl (*Quart. Rev. Biology*, 1936, p. 378). Pheasants, however, did lay in January in outdoor cages in Connecticut "in spite of very severe weather," but an irradiated Quail delayed laying until March 22 (*Science*, 1936, p. 392). Rowan himself says of the Juncos in his early experiments in Alberta, where the birds were exposed to extremely low temperatures: "While these birds attained the breeding condition, they made no attempt to breed. Canaries, subjected simultaneously to the same treatment, did not breed either, though they will do so if transferred to the high temperatures of the house."[4]

As to "any time of the year" both German experimenters cited above (Nos. 2 and 3) obtained no effect from lighting during the fall.

The start of breeding depends on many factors, differing with different species and different localities; with many birds favorable temperature here is an essential element as well as with migration. Rowan's latest experiments throw open again the question of light versus exercise, and challenge investigators to further experiments where the various factors are carefully controlled.

Does Feeding Change Wild Birds into Permanent Residents?[5]—Contrary to the ideas of A. Schifferli,[6] who considers migratory habits too deeply ingrained to be lightly changed, but in agreement with W. Haller[7], U. Bährmann believes that winter feeding is making residents out of normally migratory Titmice. He tells of his experiences in attracting birds with an ample year-round food-supply to the outskirts of a factory town in Switzerland, and of how they remained with him throughout the year—Titmice, a Great Spotted Woodpecker, and Magpies.

[1] Wagner, H. O. 1937. Der Einfluss von Aussenfaktoren auf den Tagesrhythmus während der Zugphase. *Vogelzug*, 8:47–54.
[2] Schildmacher, H. 1937. Zur Physiologie des Zugtriebes. III. Versuche mit künstlich verlängerter Tagesdauer. *Vogelzug*, 8:107–114.
[3] Putzig, P. 1937. Von der Beziehung des Zugablaufs zum Inkretdrüsensystem. *Vogelzug*, 8:116–130.
[4] *Kongressbericht*, Band I, VI. Weltgeflügelkongress 1936. p. 151.

[5] Begünstigt die Fütterung Freilebender Vögel die Standorttreue? 1937. *Der Ornithologische Beobachter*, 34:73–76.
[6] *Der Ornithologische Beobachter*. 1935, 32:62.
[7] *Der Ornithologische Beobachter*. 1934. 31:199.

WEIGHT

"A Preliminary List of Bird Weights." Paul A. Stewart. 1937, *Auk*, 54: 324-332. A summary and discussion of 1807 weighings of 1353 individuals of 66 species captured in northern Ohio. Daily weight-rhythm is mentioned, but the author does not seem to be informed on recent studies which emphasize seasonal rhythm. The season of capture should be included in lists of weights of birds.

The author is in error when he states, "It is well known that young altricial birds acquire a weight in excess of their parents (Edson, 1930)". As a matter of fact Edson (*Condor*, 32:137-141) found this true only in the case of the Violet-green Swallow, and Swallows happen to be rather exceptional in this regard among passerine birds.

"Weights of Spotted Towhees."—J. M. Linsdale and E. L. Sumner, Sr. 1937. *Condor*, 39:162-163. One hundred and sixteen weights of males of *Pipilo maculatus falcifer* (a resident at Berkeley, California) are given from October to May; monthly averages range between 38.07 and 41.66 grams with little seasonal change.

"Some Measurements and Observations from Bronzed Grackles."—L. L. Snyder. 1937. *Canadian Field-Naturalist*, 51:37-39. Excellent use was made at the Royal Ontario Museum of Zoölogy of 204 specimens of *Quiscalus quiscula æneus* captured by Jack Miner at Kingsville, Ontario, March 26, 1930; weights, measurements, plumage-characters and beak-abnormalities were studied. Weights of the 99 males ranged from 105 to 140 grams, averaging 131.4; of the 205 females from 95 to 104 grams, averaging 100.8 grams.

LIFE-HISTORY

"The Red-throated Diver in North East Land."—David B. Keith. *British Birds*, 31: 66-81. Detailed observations of the breeding behavior of *Colymbus stellatus* (*Gavia stellata*) in the Spitzbergen archipelago. Although 1936 was a "non-breeding year" in the region, "when large numbers of Ducks and Geese failed to nest", these Loons bred freely. Most of the first eggs were taken by Arctic Skuas (Parasitic Jaegers, *Stercorarius parasiticus*), but after two or three weeks the birds renested and defended their eggs fearlessly.

"On the Life History of the Fulmar (*Fulmarus glacialis L.*).[8]—This species has greatly increased during the last fifty years and has spread to many new nesting localities. R. Richter, the author, watched a colony in Scotland that is twelve years old; of the two hundred birds only one fifth to one-third of the pairs bred in any one year. When a new colony is to be started, birds come and go for several years without breeding. The birds are peaceable, but there is no trespassing on one another's small territories. The single egg is laid on the bare rock in late May and incubated for 57 days. By means of marking one bird of each of four pairs with black enamel, it was found that each parent usually incubated for four days at a stretch, although with one pair one bird incubated for one to two days only. The incubating bird was not fed by its mate, the latter staying away entirely until the day when the change is to be made. The young bird is probably fed only once each day. The fledging period lasts about 57 days. During the last week or two the young bird is probably not fed, although it is still visited by its parents.

"With Sea Birds in the Scillies." John Walpole Bond. 1937. *The Oölogist's Record*, 17:16–20 and 25–29. Descriptions of nests, with some casual

reference to behavior, of *Larus fuscus graellsii, Hæmatopus o. occidentalis, Alca torda, Fratercula arctica grabæ, Puffinus p. puffinus, Hydrobates pelagicus,* and *Anthus spinoletta petrosus.* Many burrow nests were excavated, and the general picture of a famous sea-bird colony is good.—T. T. McC.

"Crow-Waterfowl Relationships."—E. R. Kalmbach. 1937. U. S. Dept. Agriculture Circ. 433:1–35. Of 512 duck nests in the Prairie Provinces of Canada 250 (49 per cent) produced young. "Crows were definitely chargeable with the destruction of 156 nests (31 per cent), though some of these may have been deserted by the female before the eggs were eaten." "On the area studied the crow was probably at its worst." In such areas "rational crow control" with "solicitude for the privacy of every nesting duck" is recommended. "Waterfowl have been the victims of the combined effects of over-shooting, drought, disease, predators and destruction of habitat, but the crow in Canada has suffered little from any of these and has even profited to the extent that agriculture has displaced the bush with open fields, grain crops, and plowed land. In recent years crows that nest in the Prairie Provinces have found also on their winter range in Kansas and Oklahoma an increased and copious food supply in the milo, kafir, and other sorghum crops. These circumstances favor the abundance of the crow at the expense of the waterfowl."

"The Nesting of Bald Eagles in Southeastern Florida." Joseph C. Howell. 1937. *Auk*, 54:296–299. This paper is chiefly concerned with measuring decrease in numbers of *Haliæetus l. leucocephalus,* but has some material on behavior, notably on the building of nests, of which one pair may build and use as many as five in eight years, even though the first remain in good repair. The Florida eagles present an instance of northern hemisphere winter breeding. The earliest eggs were recorded in late October, the latest in early March, with seventy-five per cent of the total in December.—T. T. McC.

"The Evaluation of Nesting Losses and Juvenile Mortality of the Ring-necked Pheasant."—P. L. Errington and F. N. Hamerstrom, Jr. 1937. *Jour. Wildlife Management,* 1:3–20. A reworking of the data on 503 nests of *Phasianus colchicus torquatus* found in Iowa from 1933 to 1935 by Hamerstrom (see *Bird-Banding,* January, 1937, p. 37, for review). Loss of an incomplete clutch "may mean little or no delay in the starting of another clutch," but if a clutch is lost when well advanced in incubation, "the succeeding clutch will probably not be begun for some time." (This was not true with my Song Sparrows, where new sets, no matter what the stage of the eggs or nestlings, will be started 5 days after the disaster.) Mortality of the hens in the nesting season comes chiefly through mowing machines. A few birds will incubate "unhatchable eggs for most of the summer." Although 59 per cent of 234 cluches failed to hatch, it is calculated that "from 70 per cent to 80 per cent of the hens finally succeed in bringing off broods." Regardless of season of hatching, the average number of young per brood showed a surprisingly regular decline from 8.7 young at hatching to 5.92 at four to five weeks and 4.92 at eight weeks or older. The severe winter of 1935–36 caused heavy losses among the Pheasants; broods in 1936 appeared to be consistently larger than before, in a dozen cases averaging nine young at the age of four weeks.

"Least Tern Studies—1935 and 1936."—J. A. Hagar. 1937. *Massachusetts Audubon Bull.* 21 (May) : 5–8. A colony of two hundred pairs of *Sterna antillarum* were studied on Plymouth Beach, each nest being marked and visited every day. Eggs were laid at intervals of two days; incubation lasted 19 to 24 days, usually 20 to 23 days; young flew when 17 to 19 days old. Adults losing their nests renested in about three weeks. The two hundred pairs had 428 nests; 308 (72 per cent) were lost before hatching. Of 820 eggs only 212 hatched (26 per cent); of 212 chicks "only about 75 reached flying age or 9 per cent of the total eggs

laid." The birds insisted on nesting "only on the barest and flattest part of the beach, just above *ordinary* highwater mark, so that any unusual storm tide washes away the eggs." There was 19.4 per cent loss from this cause. Rats ate 66.5 per cent of the eggs, and nearly 50 per cent of the young. When eggs are washed by a high tide, the bird makes a considerable effort to salvage them; it hovers close by, resumes sitting, and makes a nest around one egg and collects the other. If more than fifteen to eighteen inches away, the parent abandons them, but some other bird may add them to her nest, or, if she has lost her own eggs, adopt them. In nests on moving dunes, the parents were constantly digging out the eggs; one such nest was moved forty feet from its original position.

"Notes on the Breeding of the Ground Dove in Florida".—D. J. Nicholson. 1937. *Wilson Bull*; 49: 101-115. The most interesting item in this paper is the evidence that the birds did not follow the typical routine of most Doves, where the female stays on the nest from late afternoon till some time in the morning, when the male takes her place for six to eight hours at a stretch. With *Columbigallina p. passerina* the parents took turns during the day in sessions of perhaps one and one-half to two hours. The young were fed pigeon milk many times a day. Soon after the young hatched, the parents repaired the nest, which was sagging from a heavy rain, the male bringing materials and stepping on his mate's back to give them to her. A summary at the end of the paper would have been helpful.

"Life History of the Greater Spotted Woodpecker."[9]—A continuation of Dr. O. Steinfatt's thorough and detailed study of *Dryobates major*, the first part of which was reviewed in *Bird-Banding* for July, 1937, p. 131. Hole-nesting birds do not need to brood small young as much as do birds building open nests. A nest with 5 young was watched from the distance of one meter for eighty hours on eight days during the later half of nest life. An all-day session (from 2 A.M. to 8 P.M.) when the young were 11 and 12 days old gave 139 feedings and another eight days later, 136, in both cases by the male alone. Excreta were removed 83 times on the first day, 28 on the latter day, and twice in thirteen and one-half hours on the following day. The average number of feedings per hour ranged from 6 to 15, with no increase in frequency with the age of the nestlings. Since an average of four insects was brought at a time, these birds must be exceedingly beneficial to the forests. The young left when 21 to 23 days old, and were fed by their father for 8 days longer. The male spent every night in the hole with the young; his rising time depended on the clearness of the sky; on a clear morning June 19th he left at 2.36, but on a stormy morning, June 10th at 4.45. As to the part played by the female, at one nest she was noted feeding nearly grown young, but at three others the male was taking sole charge. N. Tracy (*British Birds*, Oct. 1933, p. 171) found both parents feeding equally, and one of the young was fed by its father for three weeks after leaving the nest. The only detailed study of an American Woodpecker that has been published is that of Miss A. R. Sherman on *Colaptes auratus* (At the Sign of the Northern Flicker, *Wilson Bull.*, 22:135-171, 1910).

An interesting table on incubation and fledging periods of hole-nesting birds shows that the total period for Titmice, Pied Flycatcher, and Spotted Woodpecker is about the same—some 38 days—although the incubation period is 13–15 days with the two former birds and only 12 with the Woodpecker.

Martin Family Remaining Together.[10]—Four young of a pair of *Delichon urbica* in Switzerland were banded June 26th; the young of the second brood were not banded, but on September 4th the three young of the third brood were banded. On September 13th no less than thirteen Martins were found spending the night in the roomy nest—the two parents, the four young of the first brood, four unbanded young, and the three youngest, which were not yet fledged.

"Grand Manan's Acadian Chickadees."—Eleanor R. Pettingill. 1937. *Bird-Lore*, 39:277-282. Seven young of *Penthestes hudsonicus littoralis* about

ten days old were fed 362 times in one day, from 4.46 A.M. to 7.40 P.M. One parent feigned injury when a red squirrel approached the nest.

"Life-history of the Boat-tailed Grackle in Louisiana."—E. A. McIlhenny 1937. *Auk*, 54: 274-295. The life-history of *Cassidix mexicanus major* is built on a most unfamiliar pattern, like something read of in Asia or Africa rather than seen in the United States. Rarely in the mating of passerine birds is the factor of choice so freely operative. Promiscuity rather than polygamy seems to be the rule. The males of breeding age (which is two years) with elaborate displays of plumage and behavior, are simply on show like so many toys in a window, at a distance from the nest colony, whence the females, definitely and for each mating, come to select from them, isolating their choice in the course of a sexual flight or pursuit. More strangely still, while no males take the slightest interest in any individual nest, eggs, or young, certain of them (one for the small colonies, several for the larger) take up commanding positions and become the nuclei around which the rookeries are formed. They show great solicitude for the welfare of the nests *as a group*, but mate with none of the females of the rookery. What is shadowed forth is what McIlhenny calls the position of "master-protector," though it is not clear wherein lie either the mastership or the protection, especially since these males often kill and eat the young.

As might be expected under the circumstances, the sex-ratio is strongly in favor of the females. The author tied history cards to a large number of nests. In some eighty-nine of the broods which reached sexable age the ratio was over two females to one male. Large trap records indicate a similar ratio, and in the fall, when the sexes flock separately, the female flocks are much larger.—T. T. McC.

"Behavior of the Pine Siskin."—T. L. Rodgers. 1937. *Condor*, 39:143–149. Flocks of *Spinus p. pinus* in California used "location notes" only when foraging in dense foliage, but were silent in open situations. A nest was so badly tilted by the wind that three young were lost out, yet the parents "made no effort to strengthen or repair it." The female brooded constantly; the male regurgitated food to her, which she then fed to the young. Excreta were eaten for the first eight days and after that none were removed. Definite dates as to length of incubation and fledging are not given.

Life History of the Chaffinch.[11]—In Brittany banding has shown that male *Fringilla cælebs* that have nested are permanent residents, whereas young males migrate, reappearing in early February. Resident birds molt much earlier in the spring than do the transients. The female builds and incubates, the male helps feed. Nests weighed from 11 to 17 grams, averaging 15.4 grams.

"Leconte's Sparrow Breeding in Michigan and South Dakota."—Lawrence H. Walkinshaw. 1937. *Auk*, 54:309–320.—A large part of this paper on *Passerherbulus caudacutus* is devoted to history, distribution, eggs, and weight changes, but certain nesting habitats in rush-grown marshes, unlike the sites in fine grass or sedge described in earlier records, are carefully analyzed, and the characteristic nesting behavior as seen from a blind in Chippewa County, Michigan (we are not told for how long or how regularly) is described. The incubation period is "at least thirteen days." The general pattern is one in which it is the male's job to sing, which he does some two or three hundred feet from the nest, with no other share in the incubation, brooding, or feeding. It is interesting that in such a case the song itself should be famous for its insect-like insignificance. It is carefully recorded. There is a bibliography of forty-one titles.—T. T. McC.

"Food and Feeding Habits of the Tree Sparrow."—A. Marguerite Baumgartner. 1937. *Wilson Bull.*, 49: 65–80. The male *Spizella arborea* at first feeds the young almost as much as the female, later nearly twice as much. "While the amount of feeding per hour advances conspicuously after the first few

days, it maintains thereafter a more or less constant rate of about sixteen feedings per hour." Although at Fort Churchill in summer there is almost full daylight from 2 A.M. to 10 P.M., these birds do not begin feeding until 3.15 and cease shortly before 9.00, making a working day of seventeen and three quarter hours. A male, collected while feeding young, was found to have 41 adult insects and 4 larvae in his bill.

"The Hatchability of Chicken Eggs as Influenced by Environment and Heredity."—W. Landauer. 1937. Storrs Agri. Exp. Station Bull. 216:1–84. Detailed study of the subject, but without a summary. The most interesting points that are applicable to wild birds are those in relation to temperature. Resistance of eggs to cooling is greater during the first week of incubation than in the last two weeks. "Periods of severe cold led to a decline of hatchability," the maximum loss occurring in "eggs laid a short time *after* the minimum temperature had been reached." "Infertility, due to depressed mating habits" is excluded, since only *fertile* eggs were counted.

"Flight Speed of Birds."—May T. Cooke. 1937. U. S. Dept. Agr. Circ. 428. 13 pp. A good summary of the literature on the subject with a bibliography of 86 titles.

[8] Einiges über die Lebensweise des Eissturmvogels (*Fulmarus glacialis* L.). 1937. *Journal für Ornithologie*, 85:187–200.

[9] Aus dem Leben des Grossbuntspechtes. 1937. *Beiträge zur Fortpflanzungsbiologie der Vögel*, 13:144–147.

[10] W. Haller and J. Huber. Ueber das Nächtigen der Mehlschwalben. *Ornithologische Monatsberichte*, 45:81–82.

[11] E. Lebeurier and J. Rapine. Ornithologie de la Basse-Bretagne. *Fringilla cælebs cælebs* L. 1758. Le Pinson des Arbres. *L'oiseau et Revue Française d'Ornithologie*, 7:294–310.

BIRD BEHAVIOR

"The Companion in the Bird's World."—Konrad Z. Lorenz. 1937. *Auk* 54:245–273.—The ornithological Good Deed of the decade was performed by Francis H. Herrick (who writes the introductory note) by persuading Lorenz to boil down his *Kumpan* concept into a relatively brief essay in English. The original was reviewed in *Bird-Banding*, 6:113–114, April, 1935.—T. T. McC.

"On the 'Honey-Guiding' of Indicator."[12]—The Honey-guide (*Indicator indicator*) leads men to honey with its fierce bees, and also to animals of prey or great snakes. Many birds are "snake-guides," and many *lead away* from the nest by "injury-feigning" or other methods of making themselves conspicuous. W. Hoesch believes that the Honey-guide was originally a "bee-guide," and secondarily became a "honey-guide."

"The Function of the Goldcrest's Crown."—David Lack. 1937. *British Birds*, 31:82–83. Description of the display of the Kinglet's (*Regulus regulus anglorum*) crown in a territorial quarrel. The author discusses the function of bright colors as warning devices in *some* cases, giving seven references.

"Activity of the Screech Owl."—Harry C. Allard. 1937. *Auk*, 54:300–308. The reviewer believes in the insistence, by ornithological editors, upon the results of scientific research raised to a form capable of interesting intelligent readers, as opposed to the raw material which suffices for academic publications. But this should not mean that anything so important should, in the interest of easy reading, be shorn of its evidence. The duration of the investigation, only from late March to late May of a single year, is very short, and one would wish to judge of the validity of the figures. In general, a very close relationship was found between sunrise and return to the nest (box), a less close one between sunset and departure—just as the author, with diurnal birds, has found far closer correlation of movement with sunrise. Variations correlate with cloudiness or

incidental modifications of the light curve. During incubation and care of young, the male *Otus asio* makes a consistently longer night of it, leaving earlier and returning later. "The data and curves which have been constructed show with no shadow of doubt that the time of arrival at the box at dawn and the departure around sunset follow with nicety the sun's curve of rising and setting." "The temperature curve shows little or no relation. . . ." Allard suggests as a reason for the greater precision at dawn of diurnal birds the condition of the eye, rested, relaxed, non-adjusted, and highly sensitive to values of light-intensity, and evidently believes that even the owls may retain less fine sensitivity at the day's end. The results parallel those of S. E. Ashmore in England (*British Birds*, 28:259–260, 1935) on the singing times of a nocturnal goatsucker.

Scientific natural history consists largely in the demonstration of the obvious (provided it does not turn out the very soul of error). It is not surprising that birds should "get up" with the light of dawn, but proof of the degree of correlative precision, and its modification by local conditions, is a concrete and essential step in the study of light and the annual cycle, just now a prevalent, probably over-prevalent, doctrine.—T. T. McC.

"Some Activities of Resident Blackbirds in Winter."—Averil Morley. 1937. *British Birds*, 31: 34-41. A very interesting paper showing how little we know of our commonest birds. Communal gatherings of *Turdus merula* take place from early winter to spring in a no-man's land between territories, six or eight birds indulging there in pursuits on the ground. The rôles of pursuer and pursued are frequently reversed, showing that social dominance is not rigidly fixed. The resident female drove off females and males, all except her own mate. Females came and tried to attract attention of males. The duty of getting rid of superfluous females lies on the female in possession; if they remain they may later interfere between her and her mate. Some males "appear too weak to ensure the sanctity of their homes, and their unfortunate mates are harried by interloping males when in the very act of building the nest. I have known only two cases of this but in both the female showed anger and intense dislike of the intruding male, though in one case he was physically a far more splendid bird than her puny, almost female-coloured mate."

"Behavior of Black Skimmers at Cardwell Island, Virginia."—Olin Sewall Pettingill, Jr. 1937. *Auk*, 54: 237-244. These excellent, if somewhat random, observations of the latter part of the breeding season of *Rhynchops n. nigra* substantiate the fishing-flight and actual fish-catching with the lower mandible shearing the water, but detect no advantage in the process, as an additional stroke is needed in any case to catch the fish. From the instances noticed during brief observation, there must be common, perhaps general, mixing of broods, for the downies wander early and far, often to find shade, and adults readily accept strange young. Good details are the freeing of eggs from drifted sand by the parents, and the freeing of themselves by the young, a variety of injury-feignings, and a stick-passing ceremony leading to immediate copulation.—T. T. McC.

"Biology of the Rosella Parrot, *Platycercus eximius*."[13]—Daily feeding tests of three kinds of Parrots gave the following results: a Rosella weighing 83 grams ate 10 grams, a *Forpus viridus* of 23 grams ate 7.5 grams and *Melopsittacus undulatus* weighing 35-45 grams ate 11 grams. Rosella mates do not sit beside each other and preen each other; a young bird raised alone from the age of three weeks had his reactions tranferred to people, but showed no friendliness except that he tried to feed his master. If the food was not immediately accepted the parrot became furious and attacked the man.

"The Flocking of Birds, with Particular Reference to the Association of Small Insectivorous Birds."—K. A. Hindwood. 1937. *Emu*, 4:254-261. This rapid discussion of the theory of the mixed flock is worth reading, as a review

of the subject or for the account of the organization of a small mixed insectivorous flock studied near Sydney, in which the five species had a definite order of procedure from tree to tree (which of course means that one species provided the stimulus to movement), and in which it appeared that, in spite of the noise and superficial confusion, the individuals "were under some form of mass suggestion." The feeding habits of the species showed no overlap, but there probably was disturbance of insects and hence help of each species by the rest. As the author quotes John Burroughs: "Together they made a pretty thorough search,—fine, finer, finest." Possible factors of security and companionship are dwelt upon. —T. T. McC.

"The so-called Injury-feigning in Birds", II and III.—The Reverend F. C. R. Jourdain. 1936 and 1937. *The Oölogist's Record*, 16:62-70 and 17:14-16. These are the second and third parts of a paper not at first intended to be continued, of which the original part, (*Oölogist's Record* 16:25-37) was reviewed in *Bird-banding* 7:181. The present parts are largely filled with records of kindred phemonena in new species, published or sent to the author in the wake of the interest stimulated by the first publication. At first content to criticize adversely conceptions of conscious "feigning" or of "paralysis" or "incapacitation" by fear, the author in the second part is more constructive. He divides behavior on disturbance from the nest into three phases: (1) When the only course is flight, silent or otherwise; (2) when there is a chance to lead away the intruder by slow movement, just out of reach (all injury-feignings belong here, but apparent feigning is probably the result of limited range of gesture and action); (3) when an attackable enemy threatens harm to the nest—the case of the curlew flying in the face of the sheep. In all these cases the element of fear for itself is believed both absent from the bird's mind and unnecessary.—T. T. McC.

[12] Ueber das "Honiganzeigen" von Indicator. 1937. *Journal für Ornithologie*, 85:201–205.
[13] Hampe, H. 1937. Zur Biologie des Rosellasittichs, *Platycercus eximius*. *Journal für Ornithologie*, 85:175–186.

ECOLOGY AND POPULATION PROBLEMS

"A Review of Bird Census Work and Bird Population Problems."—David Lack. 1937. *Ibis*, 14th Ser. 1:369–395. Excellent review with 165 titles. A valuable table of breeding-bird populations in different habitats from Lapland, Finland, England, Germany, Africa, and the United States shows extraordinary variations in the numbers of birds. The author discusses methods, food, predators, fecundity, mortality, territory, etc. He states, "In many countries today the normal effects of predators can no longer be determined as their numbers have been so heavily reduced." He recommends the use of the number of adults to one hundred acres as the unit for censuses in England and America. He concludes: "The study of bird ecology must be regarded as in its infancy, and this survey chiefly indicates the gaps in our knowledge."

"Food Habits of Marsh Hawks in the Glaciated Prairie Region of North-central United States."—P. L. Errington and W. J. Breckenridge. 1936. *Am. Midland Naturalist*, 7:831–848. An excellent detailed study. The authors conclude that "the accumulating data from other researches show a trend of thought away from the idea that predation has a dominant influence on animal numbers collectively," and that there is evidence "that a great deal of predation may not be so much in proportion to population as to *over-population*."

"The Heathland Birds of South Haven Peninsula, Studland Heath, Dorset."—David Lack and L. S. V. Venables. 1937. *The Journal of Animal Ecology*, 6:62–72. This is a preliminary publication of the British Trust for Ornithology, leading toward an intensive survey of the ecology of the plants and animals of this small peninsula of heath and moorland. Densities of populations of Meadow Pipets (*Anthus pratensis*), Skylarks (*Alauda a. arvensis*), Stone-

chats (*Saxicola torquata hibernans*), and Wrens (*Troglodytes t. troglodytes*), are measured and correlated with plant communities and geological factors. For example, among the positive correlations is the following: dunes, commonly, are populated by Skylarks; these dunes have none. These dunes are also unique in low calcium carbonate content and consequent lack of certain low-turf associations, favorable to Skylarks.

Too much cannot be said to encourage any technique for *describing country* and correlating its character with avian distribution or density. The only languages capable of this, it would seem, are those of geology and botany.—T. T. McC.

"Bird Distribution on Surrey Greensand Heaths: the Avifaunal-botanical Correlations."—L. S. Venables. 1937. *The Journal of Animal Ecology*, 6:73–85. "The most important factor influencing bird-distribution, and indeed the actual species make-up of the breeding community, is the particular phase which any piece of heath has reached in the botanical succession following, usually, a fire." After a detailed analysis of this dynamic succession in its relation to birds a variety of lesser factors are discussed, of which the most interesting are "ecoclimates," those still generally ignored, minutely local variations in temperature or other factors which may be all-important in determining, for instance, a nest site, and song-posts, of which the specifically inherent character is considered a principal determinant of the territories of most of the group of birds in question. The ground thus cleared, an attempt is made to tabulate territory requirements under two headings, first the phase in the dynamic succession, second the "limitations and common factors" shown by the species within the phase. These papers propose the most consistent and purposeful approach to the problem of local distribution which has been published.—T. T. McC.

"The Immigration of Waxwings in Spring 1937."—Evelyn V. Baxter and Leonora Jeffrey Rintoul. 1937. *The Scottish Naturalist*, 226:93–101. This event was so spectacular and so carefully recorded that, speaking for "foreign" readers, it is a pity not to have analyzed and plotted it on a map instead of in crackling lists of glorious Scottish place-names it would take a day to look up. Late last winter *Bombycilla garrulus*, working north on the continent toward its breeding grounds, encountered phenomenal snow and lack of food as its vanguard approached Scandinavia, along with heavy cyclonic storms creating east winds over and to the east of Scotland, which probably helped deflect the flight to westward. Such invasions of Scotland (the last great one occurred in 1921) have usually come in the late fall and early winter; this began in early February and ended in early April. There is much information on food, and emphasis on the birds' extreme tameness, which appears to exceed that of the Canadian population, as known to the reviewer, under normal conditions. It is disturbing that while both sporadic invaders from the north, crossbills and waxwings, are endowed with superstitious attributes, the crossbill is auspicious, while waxwings are birds of evil omen, presaging bad weather, war, pestilence, or sudden death.—"the devil's own bird!"—T. T. McC.

"Ruffed Grouse Management."—Ralph T. King. 1937. *Jour. of Forestry*, 35: 523-532. Of this valuable paper with its sane suggestions for improvement of cover and other conditions for *Bonasa umbellus*, there is space to mention only a few points. The highest breeding density on good range is one bird to four acres. There is 75 per cent mortality of the young from hatching to fall; winter mortality of the birds comes to about 20 per cent. "The allowable shootable population is the excess over the maximum breeding population plus 20 per cent."

"No species can be rightly included on the game list unless we know enough about that species to enable us to produce surplus populations and until we can demonstrate that such surplus populations actually exist. It is understood that shooting should always be limited to these surpluses."

What appeal can there be from the logic of this statement? Here is the criterion to use in disputed questions as to the shooting of other species, for example Ducks.

Effect of Drought in Tunis.[14]—The very severe drought in 1936 was disastrous both to men and wild life. *Perdrix gambra* failed to breed, while three species of larks—*Rhamphocoris coltbey*, *Alæmon alaudipes*, and *Galerida cristata*—laid only two to three eggs instead of the usual five or six. An interesting account is given of collective fishing by hundreds of Cormorants on a bleak day. Wintering Starlings do so much damage to the olive crop that the government destroys them with dynamite, and men collect them from their roosts in the marshes and sell them for food; yet such measures make little impression on their numbers. Some of these had been banded in Poland, Germany, Bulgaria, Austria, and Italy. Cold weather in late April killed migrating Swallows and Martins.

[14] De Guirtchitch, G. 1937. Chronique Ornithologique Tunisienne pour l'Anneé 1936. *L'Oiseau et la Revue Franc. d'Ornithologie*, 7:450–472.

BOOKS

Bird Behaviour. A Contribution Based Chiefly on a Study of the Black-headed Gull.—F. B. Kirkman. 1937. London. Nelson. 232 p. 7sh. 6d. In this fascinating book based on studies on *Larus ridibundus* from 1905 to 1935, the first eight chapters are devoted to a "plain tale" of nesting behavior, the next four to the "mentality of gulls", and the last four to their emotions. Several appendices, an index, and a bibliography on animal psychology citing one hundred eleven authors, with many titles under some names, complete the volume. The account of the careful scientific observations and experiments is illustrated with many photographs, and written in an entertaining style. That the Gull does not plan out its nesting-cycle is plain from the fact that it will incubate a ball or a box instead of its eggs. Some Gulls grow to be too old to breed, being "easily recognized by their dilapidated plumage and general air of feebleness."

Significant data are given on social life: the birds nest in groups of four to fifteen pairs, all the birds knowing each other personally, and although not any too amiable to members of the group, they are far more hostile to "outsiders". They defend one another's nests from depredations by strangers, and they never suck the eggs of their own group. This little flock within the mighty flock of thousands would seem to be a defense unit and the device by which the birds can function socially and not be overwhelmed by sheer numbers. This is an important book containing a vast amount of material on Gull psychology, but the author fails to weave the different parts of the pattern into a comprehensive whole.

Handbook of German Birds. (Handbuch der Deutschen Vogelkunde.) Vol. I. Passeres.—Günther Niethammer. 1937. Leipzig. Akademische Verlaggesellschaft M. B. H. 474 p. 13.50 reichsmarks. This excellent guide gives in brief form description of plumages, molts, size, and weight; field marks; range; migration (much information from banding); habitat; breeding, treating all essential points including share of sexes in building, incubation, etc., length of incubation and fledging, etc.; food; parasites. The only improvement the reviewer can suggest is that references on life-history matters should have been given with sufficient fullness, so that they could be found; space for this could have been made by treating the parasites in abbreviated form, perhaps in an appendix. This volume will prove invaluable as a reference book, and will also serve to point out gaps in our present knowlege. It is a sad fact that such a book could not be satisfactorily written for either the East or the West of our country, because we still know too little of the most elementary facts about the life-history of our birds, even the most common species.

Concord River.—William Brewster. 1937. Cambridge. Harvard Univ. Press. 259p. $3.50. This second volume of selections from the diaries of William Brewster is handsomely got up with attractive pictures by Frank Benson (although

the frontispice of Wood Ducks is disconcertingly purple), and is a much more usable book than the first volume, because of its extensive index, which sometimes serves in the place of explanatory notes.[15] Many happy experiences with birds and beasts are told, revealing this naturalist's powers of keen sight and accurate description and his mastery of distinguished prose.

[15] The later impressions of Brewster's *October Farm* are also equipped with an index—Editors.

Crooked-Bill. The Life of a Quail.—I. H. Johnston. 1937. Philadelphia. Dorrance. 179p. $2.00. Written in Thornton Burgess vein with Peter Rabbit's place taken by the Bob-white "Crooked-Bill," this is a pleasant book for children, giving accurate information, and being well calculated to arouse the sympathies of young readers for wild birds.

The Natural History of Magpies.—Jean M. Linsdale. 1937. Pacific Coast Avifauna 25. 234p. $3.50. The aim of this large monograph is "to give a résumé of all that is known about magpies", and with this in view Dr. Linsdale has searched the literature and offers an impressive array of quotations about the genus *Pica* from western North America, Europe, and Asia. The reviewer feels, however, that there is not enough of a nucleus of original observations to justify the labor and expense of such a compilation. Unfortunately one of the most illuminating contributions to the sociology of Magpies was missed—Konrad Lorenz's account of the behavior of his tame bird (Beiträge zur Ethologie sozialer Corviden. 1931. *Jour. f. Ornith.*, 79: 80-86); in which important observations are given on courtship, territory, and, of particular interest, on an instinctive social reaction of tormenting predatory animals.

A Survey of the Resident Game and Furbearers of Missouri.—Rudolf Bennitt and Werner O. Nagel. 1937. Univ. of Missouri Studies, 12 (2): 1-215. $1.25. An excellent report giving the present status of game species of the State and excellent suggestions for their "management". Bob-whites and Mourning Doves have increased, but Ruffed Grouse, Prairie Chickens and Wild Turkeys have greatly decreased. Some of the chief adverse factors are grazing of woodland, plowing of wild grassland, illegal shooting, and depredations of the cat. It is estimated that 50 per cent of the Bob-white population is shot each fall; the authors consider that 40 per cent would be safer. The drought of 1934 did not affect the Doves, but had disastrous effects on Prairie Chickens and Bob-white, many of the former dying from thirst, while with the latter many deserted nests were found, and some birds did not pair off till the rains in mid-August. Over $100,000 has been spent on introducing Pheasants into Missouri, but this species has failed to become established. "It is worth noting that a few thousand dollars spent on finding out *at the outset* of this whole performance would have accomplished one of two things: (a) it would have given us pheasants, or (b) it would have saved the waste of ten times the amount of money spent on the investigation."

The value of native predators is set forth and the seriousness of the cat problem emphasized. "With the exception of the cat, the weight of evidence is heavily in favor of the predators. To date every comprehensive scientific study has indicated the general and positive *value* of predators as a class."

Round About the Crane. (Rund um den Kranich.)—Georg Hoffman. 1936. Oehringen. Shriften des Deutschen Naturkundevereins. 176p. 3.85 reichsmarks. A beautifully written book on the life of the birds in a bog in West Prussia, in which the great Cranes (*Megalornis grus grus*) hold the center of interest; we learn of the close association between the mates, the incessant calling of a bereft bird for a new mate, the bond between the family even in the great fall flocks. Valuable studies were made of the nest life of the Marsh Harrier (*Circus aeruginosus*) and particularly of the Spotted Eagle (*Aquila clangula*). Accurate

observations and superb photographs by the author combine to make this a notable book.

Ecological Animal Geography. An authorized rewritten edition based on *Tiergeographie auf oekologischer Grundlage* by Richard Hess. Prepared by W. C. Allee and Karl P. Schmidt. 1937. N. Y. Wiley. 597p. $6.00. "Zoögeography is the scientific study of animal life with reference to the distribution of animals on the earth and the mutual influence of environment and animals upon each other." In this fascinating book a wonderful picture is presented of life and its adaptations. To the ornithologist the first and last sections will be of greatest interest: "Ecological Foundations of Zoögeography" and "The Distribution of Land Animals." Here he can find broad foundations for his own science, a view of basic relations of the whole community, and the methods by which animal life adapts itself to different conditions and different regions of the world. He reads of effects of temperature on metabolism, of effects of humidity, light, and many other factors. Each subject can be followed up by means of the abundant references—over fifteen hundred in number.

The final chapter is devoted to the Effect of Man on the Distribution of Other Animals, which gives a dispassionate account of the profoundly disturbing effect that civilized man has had upon nature. "Special biotopes are more and more sacrificed to civilization." Under conditions of cultivation a "small number of species goes hand in hand with a great number of individuals in environments of this uniform type, as so often occurs elsewhere under partially adverse conditions." The authors point out disadvantages of forests of a single species, and the menace of stream-pollution, and protest against the "mass destruction of animal life" through the "indiscrimate broadcasting of poisons" by the Bureau of Biological Survey of the United States. It is a terrible indictment of civilized man that at this stage in the earth's history the following statement can be made: "The original faunal conditions are to be found only in distant wildernesses, in high mountains, in tropical forests, and in the depths of the sea."

Bent's 'Life Histories of North American Birds of Prey (Part I.). The present volume,[16] the tenth in the series of Life Histories of North American Birds, follows, in the main, the "order of arrangement of families and species as given in the old (1910) check-list", from the California condor through the northern bald eagle. The osprey is added, leaving the caracaras and the falcons to be considered with the owls in the next volume.

The method of describing the birds' habits is the same as that used in the previous volumes. The life history of each bird is divided into headings which together round out the yearly cycle of the bird's activites. This method, necessary for quick reference, rarely causes confusion or duplication, and does not, as handled by Mr. Bent with the aid of his correspondents, often interrupt in the least the smooth unfolding of the picture of the bird before our eyes. Perhaps the best biography, from this point of view, is the neat history of the white-tailed kite.

Ornithologists have long and impatiently awaited the publication of Mr. Bent's life histories of the Raptores, realizing that he has devoted himself to the study of this group ever since his boyhood, half a century ago; that he has travelled extensively, from Florida to Alaska, in order to become familiar with the rarer species; and that, viewing these birds through the vista of long years of experience, he can write of them with unquestioned authority.

There is no doubt that the present volume, with the volume to follow, much of which the present reviewer has had the pleasure of reading in manuscript, will be accepted as the classic work on the American Raptores.

Certain of the life histories are extended into virtual monographs of the birds as studied in south-eastern Massachusetts, where the author has had certain nests and successive pairs of birds under observation for a long series of consecutive years. In these articles he brings out interesting facts which could not have been

discovered by study for only a few years, no matter how thorough. For example, under the Cooper's Hawk he says (p. 112): "I have frequently found one of these Accipiters nesting in the same tract of woods with one of the Buteos, but I have never found the two species of *Accipiter* nesting in the same tract; and several times I have known *cooperi* to replace *velox* in a tract where the latter had repeatedly nested. It is a curious fact that the solitary vireo (*Lanivireo solitarius*) has so often been found nesting in pine woods occupied by a pair of Cooper's hawks as to suggest some significance in the ecology; I find six such cases recorded in my notes, and once the vireo's nest was within 50 feet of the hawk's nest; we have also noted that we never find the vireo in similar woods occupied by sharp-shins; the reason seems obvious." Again (p. 160) he says: "Great horned owls habitually occupy old nests of the eastern redtail, probably preempting them before the hawks are ready to use them. I have always regarded these two as supplementary species, one hunting by day and one by night in similar regions and preying on similar victims."

In the consideration of "the complicated relationships in the *Buteo borealis* group" Mr. Bent shows the toleration and the absence of dogmatism which mature judgment brings. He says (p. 174): I . . . have examined an immense amount of material in various museums and private collections; but I must confess that there are many perplexing problems yet to be worked out before the relationships can be fully understood."

As we read the 379 pages of the text, not picking out the best bits, but reading from cover to cover as we would read a novel, the scene changes many times; we visit inaccessible cliffs on the Rocky Mountains, depths of dark southern swamps, barren deserts, and the dense growth of the northern forests. We follow the intimate family life of the inhabitants of these solitudes, the characters in Mr. Bent's story. We see among them giants, great birds with a hint of royalty, strong, fearing nothing; and others, secretive, striking as from ambush, like a knife in the dark. They all seem to glory in their power and speed, or in their mastery of the air, and most of them are self-sufficient characters—lone wolves—preying on living animals which they overpower by their fleetness and strength, and when they strike, they kill.

Mr. Bent shows us tragedy, but in his story we look at the struggle through the fierce eyes of the hawk, the hero of the book.—WINSOR M. TYLER.

[16] *U. S. Nat. Mus. Bull. 167.* Life Histories of North American Birds of Prey. Order Falconiformes (Part I.) Smithsonian Inst., Washington, D. C., pp. I–398, p. I–102. Supt. of Documents, Washington, D. C.

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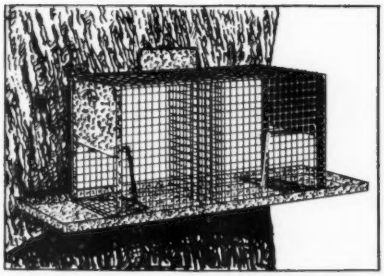

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